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13. ABSTRACT (Maximum 200 words)

In 1995, TRADOC initiated the analytical process described in the March 1995 draft Joint Venture (JV) Campaign Plan. The resulting analyses provide the basis for redesigning today's Warfighting Army for the 21st century. The combat unit elements, combat service elements, and the combat service support elements needed to be analyzed individually to determine whether or not each of these sections would be able to effectively perform under the given scenario conditions. TRAC-Lee was tasked to analyze the CSS capabilities of the three (3) division designs (Conservative Heavy, Strike, Brigadist) for DDA Phase III. The three division designs were dynamically gamed using the Vector-in-Commander model in the LANTICA III, Northeast Asia 2.0, and Southwest Asia 4.2 scenarios. The CSS elements represented in VIC were analyzed by TRAC-Lee with the primary focus of the analysis was on the maintenance and supply operations and how the CSS units functioned for the given scenario.

This analysis concluded that the CSS structure in the Conservative Heavy Division can support the division during a 48-hour battle such as the one portrayed in LANTICA III scenario. There were a few problem areas in the CSS elements that were focused on in this analysis. The mechanics at the CSB(DS) could not maintain all of the damaged vehicles sent to that unit for repair; moreover, some of the artillery units used all of their ammunition reserves and were not resupplied in a timely manner.

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STUDY TITLE: Combat Service Support (CSS) Vector-in-Commander (VIC) Analysis in Support of Force XXI Analyses Division Design Analysis – Phase III CSS Analysis of VIC Dynamic Gaming Conservative Heavy Division Interim Design (LANTICA III)

PURPOSE: The purpose of this analysis was to produce quantitative analysis of the Conservative Heavy Division Interim Design's combat service support (CSS) structure which was dynamically gamed in the LANTICA III scenario with the VIC model. The focus of the analysis was on the maintenance and supply operations and how the CSS units functioned for the given scenario.

MAIN ASSUMPTIONS: The principal assumptions of this study include: (a) all repair parts were available upon request, (b) Echelons-Above-Division (EAD) were fully resourced, and (c) CSS enablers and other technological equipment are present.

PRINCIPAL FINDINGS: The CSS structure in the Conservative Heavy Division could support the division during the 48-hour battle in the LANTICA III scenario with a couple of exceptions. The automotive and armament mechanics in the CSB(DS) could not handle the maintenance workload produced during the scenario. Several artillery units expended all of their ammunition resources at some time during the scenario and could not be resupplied in a timely manner.

IMPACT: This report suggests that the CSS structure in the Conservative Heavy Division is sufficient to sustain the division in a scenario such as the one portrayed in LANTICA III.

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Combat Service Support (CSS) Vector-in-Commander
(VIC) Analysis in Support of Force XXI Analyses
Division Design Analysis -- Phase III CSS Analysis of VIC
Dynamic Gaming Conservative Heavy Division Interim
Design (LANTICA III).
Technical Report



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Combat Service Support (CSS)
Vector-in-Commander (VIC) Analysis
in Support of Force XXI Analyses

Division Design Analysis -- Phase III
CSS Analysis of VIC Dynamic Gaming
Conservative Heavy Interim Design (LANTICA III)
08Jul97 VIC Analysis Data

1. General.

a. The Commanding General (CG) Training and Doctrine Command (TRADOC) tasked the TRADOC Analysis Center (TRAC) to conduct an analysis of the Combat Service Support (CSS) Division redesign concept. TRAC at Fort Lee, Virginia (TRAC-LEE) used Vector-in-Commander (VIC) analysis to provide quantitative analysis of that concept.

b. The dynamic gaming with the VIC model is based on the LANTICA III scenario with a total duration of 48 hours incremented in four hour time periods (TP) and one (1) hour reorder cycle time between CSS units. The modeled force consists of three brigades with a corps slice. Specific descriptions and details for both the scenario and modeled force are provided in the main report.

c. The analysis focuses first on those key maneuver unit resources necessary for a unit to perform its designated mission. The specific resources addressed are weapon system availability and the timely availability of supplies. Secondly, various aspects of the CSS system are examined to isolate bottlenecks or shortages which limit the provision of needed services. And conversely, excesses or under-utilized CSS resources are identified for this scenario.

d. The analysis entails two major areas: maintenance support and supply support. Since the medical support system for the treatment of personnel is very similar in function to that of the maintenance system, medical support is addressed along with maintenance.

e. VIC unit name designators are used in this report for brevity. Appendix A shows the cross reference between actual unit names and VIC unit names.

2. Model Description.

a. The Vector-in-Commander (VIC) model is a two-sided, deterministic simulation of integrated land and air combat. The level of resolution is the maneuver battalion. As a deterministic model, VIC relies upon expected values; weapon systems, transporters, inventories/stockage levels, and consumption can be fractional values. VIC is event stepped for maneuver elements and both time stepped and event stepped for calculation of combat service support (CSS) effects. The combat and combat support (CS) functions in VIC produce a workload for the CSS system. Two key modules within VIC are used to represent the CSS system: Return to Duty (RD - maintenance) and Logistics (LO - supply).

b. The return-to-duty (RD) module operates on equipment and noncrew personnel, both of which are referred to as systems, as well as crews for key combat vehicles.

(1) Workloads. The attrition modules generate combat casualty workload in the form of combat-damaged systems. These quantities are adjusted to factor out catastrophic damage/killed in action (KIA) and abandonments (equipment only) before becoming a workload on the RD system. Reliability failures to equipment and disease and nonbattle injury (DNBI) to personnel are also generated, resulting in their removal from units and their introduction as workload upon the RD system.

(2) Processes. The RD module contains representations of the recovery, evacuation, and repair functions.

(a) Recovery is constrained by the availability of operational recovery vehicles. Recovery operations are represented as a delay time of 57 to 96 minutes which includes round trip travel, hook-up, and drop-off. The recovery time varies from vehicle to vehicle and the primary location of that vehicle.

(b) Evacuation is constrained by the availability of operational evacuation vehicles and dynamic evacuation times that are a function of distance and time on the main supply route (MSR) network.

(c) Repair is constrained by the available strength and type of assigned mechanics or medical personnel. Of course repair throughput is impacted by the 'time to repair' but repair time is determined by design factors and not CSS. A maintenance unit's maintenance man-hours (MMH) is degraded by fifty percent when that unit has to relocate on the battlefield. This degradation is calculated to the nearest quarter of an hour; therefore, a maintenance unit's MMH during a portion of a TP could be degraded while the remaining MMH are unaffected. The degradation of MMH availability is based on the premise that a maintenance facility will have only 50 percent of its assets (to include personnel) fully functioning at any time during a battlefield relocation.

(3) Products. The final product of the RD module is the return of crewed systems to owning units. Intermediate products of the various RD processes include recovered systems, evacuated systems, and repaired systems.

(4) Combat impacts on RD processes. Impacts include attrition of RD assets, productivity degradation due to unit movement, changes in evacuation distances due to unit movements, and changes in evacuation speeds due to congestion of MSR links.

c. The logistics (LO) module provides the support structure to facilitate the resupply of ammunition, fuel, and other supplies to maneuver units and the restocking of these supplies at supply units.

(1) Workloads. The attrition modules dynamically generate the workload for ammunition as units engage in conflict. As units move and change posture they create a workload for fuel. A workload for other supplies is generated by a daily consumption rate, depending upon unit types. When maneuver units deplete their basic loads to specified reorder levels, a requirement for resupply is levied on the CSS system.

(2) Processes. The LO module contains representation of the resupply and move functions. Resupply to maneuver units is constrained by the availability of resupply vehicles, availability of supplies at supply units, load times, and travel time between the unit and its supplier. The availability of supplies at supply points is constrained by transportation, availability of load facilities, and load/unload times. The move function is constrained by the availability of CSS trucks, congestion of the MSRs, and travel times between supply units.

(3) Products. The final product for the resupply and distribution system is the replenishment of expended ammunition, fuel, and other supplies to maneuver units. Intermediate products include the restocking of resupply units and the movement of supplies along the MSRs from higher echelon supply units.

(4) Combat impacts on LO processes. Attrition and movement of supply units as a result of combat effects degrade the ability of these units to perform their resupply function. Resources which can be lost at the supply units include resupply vehicles, stocks, and materiel-handling equipment (MHE). The relocation of supply units results in degradation of their receipt/issue capability during the move. In addition, attrition of resupply vehicles, both at the maneuver unit and along the MSRs, degrades the ability of the CSS system to deliver supplies.

3. Assumptions.

a. Maintenance characteristics and parameters of all systems remain constant across the scenario.

b. When damaged weapon systems reach a maintenance facility, the correct tools, parts, and equipment are present at the facility. If the number of mechanics necessary to work on the damaged weapon system is available, they will begin working on the damaged weapon system immediately (i.e., prep time and time spent for damage assessment are not played in the model).

c. The DNBI rate remains constant across the scenario.

d. Resupply of all stockage items is available from echelons above corps (EAC).

4. Sufficiency Criteria.

a. Equipment. Maintain 80 percent availability of systems that have not been destroyed or abandoned. Rationale: Army Regulation (AR) 220-1, Unit Readiness Reporting, defines an equipment availability status of 80-90 percent as category C2 which is fully combat ready with minor risk.

b. Personnel.

(1) Have no weapon systems in awaiting-reissue queue due to nonavailability of crews. Rationale: The availability of weapon systems crews affects the availability criterion for combat systems.

(2) Maintain 80 percent personnel strength level for all modeled personnel. Rationale: AR 200-1 defines a personnel strength level of 80-90 percent as category C2 which is combat ready with minor risk.

c. Supply. Have no zero balance of any supply-class subitem (e.g., 155mm, 120mm, POL). Rationale: The lack of a specific type could adversely affect tactical options.

5. Maintenance Analysis.

a. The six weapon system categories covered in this analysis are shown in table M-1. The Fixed Wing category was not represented in the CSS system. In addition, medical treatment of personnel and weapon system crews are presented as a separate category.

Category	Weapon System
TANK	M1A2
AFV	IFV/TOW FSV/45MM SFV/STINGER
ADA	AVENGER
MLRS	MLRS_D
CANNON	CRUSADER-D
HELICOPTERS	AH64D RAH66D

Key Weapon Categories
Table M-1

b. The primary maintenance performance measure at the maneuver unit level is availability of unit weapon systems. Availability of unit weapon systems is determined by the current strength of weapon systems at a maneuver unit versus the initial strength less the number of catastrophically killed weapon systems at the same maneuver unit. The number of weapon systems available is a function of many dependent and interdependent factors. These factors can be partitioned into two groups: (1) those factors which render weapon systems inoperable: combat damage and reliability and (2) factors that contribute to the return of repaired systems to combat. When more weapon systems are returned to combat, a larger population is available for combat and reliability failure, which in turn workloads the Return-to-Combat (RTC) support system.

(1) Factors which cause weapon systems to become inoperable are combat damage and reliability failures. Combat damage is a function of the interaction of opposing forces resulting in catastrophic kills and repairable battle damage. The percentage of catastrophic kills versus the percentage of repairables varies by weapon system due to threat weapons and survivability characteristics. Table M-2 shows the percent repairable for each system once combat damaged. The percentages are not measures of overall survivability but are conditional results based on a weapon system first being combat damaged. Overall survivability also involves the likelihood of a weapon system being acquired and then being hit by the enemy. The percentages in table M-2 are, therefore, predicated on the occurrence of these two events.

Category	Weapon System
M1A2	93
IFV/TOW	83
FSV/45MM	83
SFV/STINGER	83
AVENGER	69
MLRS_D	71
CRUSADER-D	49
AH64D	41
RAH66D	41

Percent Repairable by Weapon System
Table M-2

(2) Permanent losses of operational systems can occur in several ways. The most frequent is usually due to catastrophic combat damage. In addition, both types of candidate repairables (combat and reliability) are subject to weapon system abandonment at the maneuver unit or maintenance unit level. Maneuver and maintenance unit abandonments of weapon systems occur due to immediate war-fight conditions, thus becoming permanent losses like catastrophic kills (no systems were lost due to maintenance unit abandonments). Weapon systems can be traveling on an MSR when the scenario ends; thus these weapon systems are not considered part of a combat unit's arsenal. Another key factor which affects availability is the nonavailability of an owning unit. This occurs when a maintenance unit has repaired systems but does not have a maneuver unit in its area of influence with authorization to accept the system. In some cases, such weapons are never reissued during the scenario. Crewed weapon systems' RTC may be delayed because the appropriate number of crew members is not available to operate the weapon system. All five of these factors (catastrophic damage, abandonments, currently being reissued, unit non-availability, and weapon systems waiting crews) are independent of the CSS system performance. Table M-3 shows the number of systems for each of these categories at the end of the scenario.

Weapon	# Weapons Waiting Units	# Weapons Waiting Crews	# Weapons Being Reissued	Maneuver Unit Abandonments	Catastrophic Kills	Total
M1A2	0.0	0.0	23.0	1.9	4.9	29.8
IFV/TOW	0.0	0.0	8.6	0.6	10.9	20.1
FSV/45MM	0.0	11.1	1.5	0.0	4.1	16.7
SFV/STINGER	0.0	0.0	0.9	0.7	0.6	2.2
AVENGER	9.4	Not crewed	0.0	0.0	4.3	13.7
MLRS_D	0.0	0.0	0.7	0.0	0.2	0.9
CRUSADER-D	0.0	0.0	0.0	0.0	1.9	1.9
AH64D	0.0	0.0	8.4	0.0	9.0	17.4
RAH66D	0.0	0.0	8.9	0.0	6.0	14.9
Total	9.4	11.1	58.9	3.2	55.0	

Weapon System Losses
Table M-3

(3) Reliability failures are based on mean hours between failures (MHBf) for the major subsystems of each weapon. The major subsystems for this study are Automotive, Armament, Helicopter, and Medical. Of course, the subsystems that fail or are damaged vary by weapon systems (e.g., the M1A2 is composed of both subsystems, automotive and armament, while only automotive is represented for the heavy equipment transporter (HET)). Each subsystem is serviced by a different mechanic type. In addition, the MHBf can vary by subsystem for each weapon. Helicopters, for this analysis, are serviced by a single type master mechanic although both automotive and armament failures occur for helicopters. In addition, all wounded/DNBI personnel are treated by a single medical type. The availability and performance of trucks used for resupply is addressed in the supply section of the report.

(4) Factors which influence the RTC of weapon systems are recovery, evacuation, and repair (to include medical treatment of personnel and crews) resources. Each of the CSS resources which performs these services is subject to both combat damage and reliability failure, which determine their availability for weapon system processing and treatment of personnel. Recovery and evacuation are performed on a designated priority basis, while repair and treatment are based on a more complex priority system. Further complicating the impact of repair on weapon system RTC are the repair characteristics of individual weapon systems. These characteristics vary by level of repair (i.e., unit (ORG), direct support (DS), general support (GS)), and mean time to repair for each type repair (combat, reliability). These characteristics represent a very complex interrelated system which determines the number of operational weapon systems.

c. Analysis. The maintenance analysis is divided into three sections (Support Services Sufficiency, Key Weapon Availability, and CSS Workloads):

(1) Support Services Sufficiency.

(a) Recovery - Weapons.

1 Recovery operations serviced the recovery workload in a timely manner. "Timely manner" is defined as servicing the recovery workload within two TPs for a given maintenance unit. To meet this criterion the recovery workload at the end of one TP must be serviced in the next time period. The reason for this explanation of "timely manner" is to account for the maximum time of 96 minutes it takes for a recovery vehicle to assist in the recovery of a damaged weapon system or vehicle. If a vehicle requires an assisted recovery during the last half of the current TP, that vehicle would not reach the designated maintenance area until the next TP. The two recovery vehicles modeled are the improved recovery vehicle (M88) and a generic recovery vehicle (HMTWRECKER) which represent all other recovery vehicles which are not M88s. Table M-4 provides an overview of both recovery vehicle's status for the scenario where:

Initial Strength (stgn) is the assigned density at the start of the scenario.

End Strength (stgn) is the number operational at the end of the scenario.

End Availability is the percentage of initial strength available less the number destroyed or abandoned at the end of the scenario.

M88				HMTWRECKER			
Unit ID	Initial Stgn	End Stgn	End Availability	Unit ID	Initial Stgn	End Stgn	End Availability
B000000	31	28.7	93	B000000	16	16.0	100
B20000H	1	0.9	93	B2000AR	20	19.9	100
B2000AR	27	25.0	93	B2000DC	4	4.0	100
B2000DC	3	2.8	93	B2010MX	7	7.0	100
B2010MX	5	4.6	93	B2011MX	6	6.0	100
B2011MX	6	5.5	91	B2012MX	6	6.0	100
B2012MX	6	5.5	91	B2013AR	6	6.0	100
B2013AR	6	5.5	92	B2020AR	7	7.0	100
B2020AR	5	5.0	99	B2021AR	6	5.3	89
B2021AR	6	5.0	84	B2022AR	6	6.0	99
B2022AR	6	5.5	92	B2023MX	6	4.9	82
B2023MX	6	4.5	74	B2030MX	7	7.0	100
B2030MX	5	4.6	93	B2031MX	6	6.0	99
B2031MX	6	5.5	92	B2032MX	6	6.0	100
B2032MX	6	5.5	92	B2033AR	6	5.6	93
B2033AR	6	5.0	83	B20L00H	4	4.0	100
				B20S00H	4	4.0	100

M88 and HMTWRECKER Ending Availabilities
Table M-4

The "end availability" is a reliable indicator of availability and recovery support throughout the scenario. Table M-5 provides the combined recovery operations for all divisional maintenance units by TP.

TP	1	2	3	4	5	6	7	8	9	10	11	12
# RECOV.	17.3	21.0	20.4	20.0	19.9	19.6	21.5	50.7	26.9	27.1	21.3	18.8
WAITING RECOV.	4.7	4.7	4.7	4.4	4.4	4.5	8.9	8.1	5.1	6.4	3.9	4.0

Recovery Operations for All Divisional Maintenance Units
Table M-5

Maintenance	Recovered by			Maintenance	Recovered by		
Unit	HMTWRECKER	M88	TOTAL	Unit	HMTWRECKER	M88	TOTAL
B20000H	0	6	6	B2022AR	1	5	6
B2000AR	39	54	93	B2023MX	0	9	9
B2000DC	0	4	4	B2030MX	25	2	26
B2010MX	25	2	27	B2031MX	0	5	5
B2011MX	1	15	16	B2032MX	1	5	6
B2012MX	1	12	13	B2033AR	0	21	21
B2013AR	0	6	6	B20L00H	1	0	1
B2020AR	24	3	27	B20S00H	1	0	1
B2021AR	1	17	18				

Recovery Workload (by M88 and HMTWRECKER)
Table M-6

2 Table M-6 lists the recovery workload for all maintenance units by recovery vehicle type.

3 Conclusion:

Recovery is not a constraint on weapon system RTC.

(b) Recovery - Personnel.

The recovery of injured personnel is implied; therefore, injured personnel do not require a recovery vehicle for transport from the battlefield to a medical facility. This phenomenon negates the possibility of a backlog of injured personnel needing recovery. Hence, personnel RTC will never be impeded by recovery assets.

(c) Evacuation - Weapons.

1 Evacuation support is performed in the scenario by HETs and a generic evacuation vehicle. The purpose of the generic evacuation vehicle is to represent the backhaul capability of other transporters. The analysis focuses on the HETs because they are considered potential constraints on evacuation. All but three of the key weapon systems utilize HETs for evacuation. The exceptions are AH64D, RAH66D, and the AVENGER. Only the performance of HETs is addressed. Weapon system evacuations are performed in a "timely manner" if damaged weapon systems are evacuated to the designated area (corps or division) within two TPs of the sustained damage.

2 Evacuation in this scenario is supported at the division area/CSB(DS) (unit B2000AR) and at the corps rear area (unit B000000) with 24 and 30 HETs assigned, respectively. Evacuations occur for two reasons:

- designation of maintenance support at higher support levels.
- lengthy clockhour repair times (any vehicle or weapon system that requires more than seven clockhours to repair will be sent to the corps support area (forward) so it will not 'tie up' mechanics at the ORG level with maintenance work that requires a considerable amount of time).
- maintenance overflow (maintenance overflow occurs when the number of hours needed to repair awaiting weapon systems exceeds a maintenance man hour threshold set for a maintenance unit).

3 Across the scenario, a maximum of two percent of the corps area's HETs and four percent of the division area's HETs were not available at any given TP, all due to RAM damage.

4 There were 19 vehicle and weapon system evacuations to the corps area which required a HET (refer to table M-7). These vehicles and weapon systems were 14 AVLBs, 2 CEVs, 1 BCMDVEH, 1 BHET, and 1 CRUSADER. As early as TP 4, the corps rear area had problems evacuating damaged vehicles and weapon systems from below division. Time period 12 saw the greatest number of vehicles and weapon systems (7) waiting to be or in the process of being evacuated to the corps area. These systems were 3 AVLBs, 2 CEVs, 1 BHET, and 1 CRUSADER.

TP	1	2	3	4	5	6	7	8	9	10	11	12
# EVAC.	0.9	1.6	1.4	1.4	1.2	1.2	1.3	1.6	2.2	2.0	2.1	2.4
WAITING EVAC.	0.9	1.3	1.8	2.2	2.5	2.8	3.0	5.5	5.9	5.1	6.2	6.9

Evacuation Workload - Corps Rear Area
Table M-7

5 There were 10 vehicle and weapon system evacuations to the CSB(DS) which required a HET (refer to table M-8). These 10 vehicles and weapon systems were 7 M1A2s, 2 AVLBs, and 1 IFV/TOW. All vehicles and weapon systems requiring evacuation to the CSB(DS) were evacuated in a "timely manner."

TP	1	2	3	4	5	6	7	8	9	10	11	12
# EVAC.	0.2	0.4	0.5	0.3	0.4	0.4	0.2	0.8	2.0	3.6	1.5	0.5
WAITING EVAC.	0.0	0.2	0.1	0.1	0.2	0.1	0.1	0.1	3.0	1.3	0.3	0.1

Evacuation Workload - CSB(DS) Area
Table M-8

6 Conclusion:

Evacuation is not a constraint on weapon system RTC.

(d) Evacuation - Personnel.

This function was not represented in the VIC model, therefore, no personnel evacuation output data was available for analysis.

(e) Repair - ground based weapons.

1 Sufficient repair support is determined by the availability of required mechanic types at the supporting maintenance facility for ORG/DS and GS levels. For the most part, FORCE XXI mechanics in the DISCOM are modular in that they can repair both ORG and DS level damaged vehicles and weapon systems. Table M-9 shows, for assigned ORG/DS level mechanics, the maximum MMH percentage utilized for each of the 19 maintenance facilities across the scenario. When this percentage is 100, sufficient mechanics were not available to service the workload (note shaded cells) at some point during the scenario.

2 There is one exception to the above described 100 percent indicator - maintenance backlog overflow. Resource status is reported only at the end of a TP thus making it possible that 100 percent utilization occurred within the TP but shows less at the end of the TP due to completion or repairs. So the condition can exist where the ending TP utilization is less than 100 percent but within a TP, conditions existed that caused maintenance backlog overflow.

3 In general, for those facilities with less than 100% utilization at the end of a TP, sufficient maintenance resources were always available. There were only minor exceptions when very small fractional workloads were evacuated due to backlog status and the MMH utilization was not 100%. Any under-utilized resources are not necessarily "excesses" but are indicators of the magnitude of the workload for this scenario. Force structure implications are not addressed in this report.

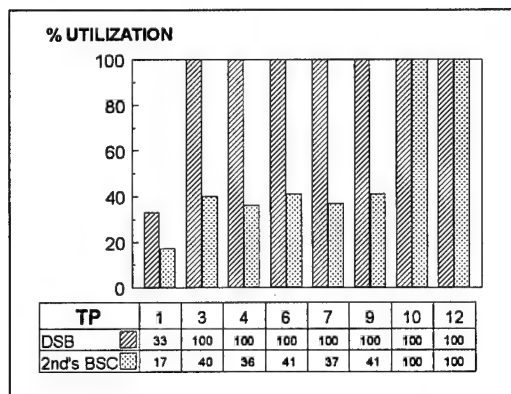
4 Figures M-1 and M-2 show the MMH utilization by mechanic type for those maintenance units with 100 percent utilization.

Unit Name	Armament		Automotive		Helicopter		Medical	
	Util. %	Str.	Util. %	Str.	Util. %	Str.	Util. %	Str.
B000000	15	58	100	155	4	22	14	376
B20000H	0	5	4	26	0	29	7	22
B2000AR	30	9	100	13			100	34
B2000DC	57	5	9	44			66	12
B20020H	0	1	5	6	8	35	59	7
B2010MX	15	6	89	11			33	22
B2011MX	29	31	40	57			55	21
B2012MX	53	31	46	57			45	21
B2013AR	15	26	16	60			56	18
B2020AR	62	6	100	11			35	22
B2021AR	84	26	76	60			60	18
B2022AR	9	26	7	60			46	18
B2023MX	15	31	28	57			69	21
B2030MX	8	6	79	11			33	22
B2031MX	5	31	8	57			45	21
B2032MX	5	31	9	57			45	21
B2033AR	85	26	58	60			50	18
B20L00H	0	1	6	6	47	21	100	7
B20S00H	0	1	4	6	80	21	100	7

Utilization and Initial Strength by ORG/DS Level Mechanics
Table M-9

a No maintenance facility's ORG level armament mechanics were 100 percent utilized.

b The automotive mechanics in the DSB and the 2nd brigade's BSC were 100 percent utilized for at least one TP during the scenario.



Automotive Mechanic Utilization for
the DSB and the 2nd Brigade's BSC
Figure M-1

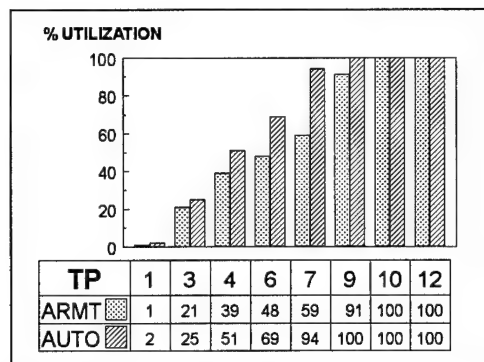
- The automotive mechanics in the division support battalion were fully utilized from TP 3 on. Starting at TP 7, the following vehicles or weapon systems had to be recovered to the CSB(DS) because of maintenance overflow: 7 PLS, 5 HMMVVs, 4 AVLBs, 4 MTVs, 3 CEVs, 3 M9ACEs, 2 HETs, 2 CRUSADERS, 2 LMTVs, and 1 FARV. TP 10 saw the greatest number of vehicles and weapon systems waiting for automotive mechanics to become available: 16 PLS, 12 HMMVVs, 8 MTVs, 4 LMTVs, 3 M9ACEs, 2 CEVs, and 1 CRUSADER.

- Maximum utilization of the automotive mechanics at the 2nd brigade's BSC occurred at TP 10 and 12. Five FSV/45MMs, two M1A2s, and two HMMWVs were waiting for automotive repair at the end of TP 12. No maintenance overflow occurred at this BSC because of a shortage of automotive mechanic manpower hours.

c Table M-10 shows the mechanic utilization for the CSB(DS). Figure M-2 shows the utilization of the armament and automotive mechanics at the CSB(DS).

Unit Name	Armament		Automotive		Helicopter		Medical	
	Util. %	Str.	Util. %	Str.	Util. %	Str.	Util. %	Str.
CSB(DS)	100	20	100	36	15	22	84	25

Utilization and Initial Strength by GS Level Mechanics
Table M-10



Armament and Automotive Mechanic
Utilization for the CSB(DS)
Figure M-2

- The armament mechanics at the CSB(DS) were 100 percent utilized from TP 10 on. The largest buildup of unserviced weapon systems occurred during TP 12 with five CRUSADERS and two CEVs. Table M-11 displays the number of vehicles and weapon systems waiting for automotive repair at the CSB(DS). From TP 9 on, the number of vehicles and weapon systems that were waiting for automotive mechanics to become available grew steadily.

WPN SYS	TP 9	TP 10	TP 12
M88	9	10	13
CEV	2	5	5
CRUSADER	1	1	2
FARV	3	2	2
IFV/TOW	11	15	14
M1A2	2	2	2
MLRS	9	10	11
SFV/STINGER	1	1	1
TOTAL	38	46	50

Vehicles and Weapon Systems Waiting
for Repair at the CSB(DS)
Table M-11

5 Conclusion:

Within the DISCOM, there were sufficient numbers of armament and automotive mechanics supporting each unit. The automotive and armament mechanics in the CSB(DS) could not handle the workload produced.

(f) Repair - helicopters.

Note: The AH64D (Apache) and the RAH66D (Comanche) are the systems represented by the helicopter weapon system category.

1 Sufficient helicopter repair support is determined by the availability of required helicopter mechanics at the supporting maintenance facility. The number of helicopter mechanics assigned to the helicopter battalions, the corps area, and division area can be found in tables M-9 through M-10. Note from these tables that none of the helicopter maintenance facilities had their mechanics 100% utilized during any TP of the scenario.

2 Recovery - The AH64D and the RAH66D do not require assisted recovery. If one of these helicopters receives non-catastrophic damage, that helicopter is assumed to self-recover. Helicopter RTC will never be impeded by recovery assets.

3 Evacuation - The AH64D and the RAH66D do not require a HET for evacuation. Instead, a generic evacuation vehicle is used to evacuate AH64Ds and RAH66Ds. The availability of HETs does not hamper the process of helicopter evacuation.

4 Conclusion:

None of the three CSS assets (recovery, evacuation, and repair) restricted helicopter RTC during the scenario.

(g) Medical treatment.

1 Personnel can be in one of the following three categories: combat ready, medical treatment process, or KIA. When injured personnel arrive at a medical facility, they receive treatment immediately, have to wait for the next available medic, or have to be evacuated to a higher echelon because of the severity of the wound. After treatment, injured personnel are returned to their respective unit. At TP 12, the theater's Blue troop force was at 95%, its lowest availability during any TP of the scenario (the blue troop strength at TP 12 was less than that of TP 11 by .13 percentage points). The KIA column is the accumulative blue troop losses over the scenario.

TP	Combat Ready	Being Treated	KIA	% AVAIL
0	18,868	0	0	100
1	18,799	69	0	100
2	18,683	177	8	99
3	18,683	177	8	99
4	18,679	181	8	99
5	18,587	273	8	99
6	18,585	275	8	99
7	18,477	341	51	98
8	18,071	637	160	97
9	18,025	654	189	96
10	17,847	750	271	96
11	17,669	900	299	95
12	17,660	904	304	95

Theater Personnel Profile
Table M-12

2 During the course of the scenario, the majority of personnel that are not combat ready are being treated or awaiting treatment at the corps rear area. When injured personnel have to be evacuated to corps, their severe of their injuries take approximately six days to treat; therefore, those persons will not return to duty for the remaining part of the scenario.

3 While the combined totals of the theater's blue troop forces always remained above the 80% availability sufficiency criterion, four units (units B200FH2, B2011DC, B2021AR, and B2031DC) fell below this criterion for two or more consecutive TPs. These units are listed in table M-13 along with their troop combat availability percentage. The increase of combat intensity in the later part of the scenario and the treatment time of injured troops evacuated to the corps area are the two factors that contribute to the low troop availability at these units.

TP	1	2	3	4	5	6	7	8	9	10	11	12
B200FH2	100	99	99	99	98	98	96	96	97	86	68	68
B2011DC	100	99	99	99	99	99	67	67	75	81	74	74
B2021AR	100	99	99	99	99	99	99	80	85	73	73	73
B2031DC	100	99	99	99	99	99	72	72	79	79	79	78

Percentage of Personnel Available
Table M-13

4 Conclusion:

Medical repair teams organic to echelons lower than division did not constrain personnel RTC.

(2) Key Weapon Availability.

(a) Up to this point the analysis has addressed individual CSS support services (recovery, evacuation, repair, medical treatment) and their impact on RTC. With the exceptions noted, for the most part each of these support services was sufficient for the available workloads.

(b) The following section of the report, in effect, examines the cumulative effects of CSS services by looking at the availability of key weapons. Tables M-15 through M-23 provide unit level overviews for each key weapon system.

1 Each table (M-15 through M-23) contains the following information:

-Initial Strength (stgn) - weapon system density at the start of the scenario.

-End Strength (stgn) - weapon system density at the end of the scenario.

-Permanent Losses (K-kills) - catastrophic kills and abandonments.

-End % availability - weapon system availability at the end of the scenario.

This availability calculation excludes permanent losses in conformance with the earlier described sufficiency criteria. Permanent losses are excluded because their occurrence is independent of how well (or poorly) CSS performs.

2 Two phenomena appearing in the following tables warrant discussion:

a A "dead unit" is indicated when the "end strength" and "availability" are zero. A "dead unit" occurs when significant unit resources are decimated and that unit can no longer effectively function. Its surviving resources, damaged and undamaged, are distributed to repair or other units requiring weapons, respectively. The row in each table for dead units is shaded.

b One would expect the "end strength" to always be smaller than initial strength if there were permanent losses. This is not always the case because of the need based reissue of repaired (and crewed) weapons. Depending on the current available strength of a weapon, reissues are distributed proportionally higher to those units with the greatest need (lowest current strength) and not to the unit which originally "owned" the weapon.

(c) Results:

- The ending availability of the M1A2s at the following units was below the 80 percent mark: B2021AR (48 percent), B2023MX (77 percent), and B2033AR (79 percent). Unit B2021AR had twelve M1A2s in the process of being reissued at the conclusion of TP 12. When these M1A2s are returned to their owning unit, the availability will be above 80 percent. Also, the FSC supporting this battalion had to have two M1A2s recovered to the 2nd brigade's BSC because of maintenance overflow. The main reason for unit B2023MX not maintaining an 80 percent availability strength was that three M1A2s at this unit's supporting FSC were being reissued at the end of TP 12. When these reissued systems reach their owning unit, the availability of this unit's M1A2s will be above the 80 percent mark. Unit B2033AR had a similar situation as unit B2023MX.

- The ending availability of the IFV/TOWs at the following units was below the 80 percent mark: B2011MX (79 percent), B2021AR (56 percent), and B2033AR (68 percent). Unit B2011MX had 19 IFV/TOWs sustain combat damage in TP 10. Even with these heavy casualties, the end availability of IFV/TOWs was 79 percent. The two reasons for unit B2021AR not maintaining an 80 percent availability strength were (1) that seven IFV/TOWs sustained combat damage during TP 8, and (2) two IFV/TOWs were in the process of being reissued to combat at the end of the scenario. Unit B2033AR's IFV/TOWs sustained heavy combat damage at the same TP as unit B2021AR's.

2 The following table lists the units that were rendered combat ineffective ("dead") during the scenario, the time that the unit became ineffective, and the major weapon system(s) organic to that unit.

Ineffective "Dead" Unit	Time	Major Weapon Systems
B003LA1	23.58	AVENGER
B00B6M2	23.63	MLRS_CR
B201DA1	35.18	AVENGER

Units Rendered Combat Ineffective During the Scenario
Table M-14

3 Conclusion:

With the exception of the number of mechanics at unit B2021AR, the CSS system did not constrain weapon system availability.

Reference (b).1). of Section (2), Key Weapon Availability -- end % availability is the weapon system availability at the end of the scenario. This availability calculation excludes permanent losses in conformance with the earlier described sufficiency criteria. Permanent losses are excluded because their occurrence is independent of how well (or poorly) CSS performs.

Unit ID	Initial Stgn	End Stgn	K-Kills	End % Avail
B2001DC	8	6.1	0.4	80
B2002DC	8	6.8	0.3	88
B2003DC	8	6.7	0.3	87
B2011MX	14	12.6	0.9	96
B2012MX	14	12.6	0.7	95
B2013AR	30	28.7	0.1	96
B2021AR	30	13.7	1.3	48
B2022AR	30	26.9	0.0	90
B2023MX	14	10.5	0.2	77
B2031MX	14	12.6	0.0	90
B2032MX	14	12.9	0.0	92
B2033AR	30	21.6	2.6	79
Total Permanent Losses			6.8	

MIA2 Status
Table M-15

Unit ID	Initial Stgn	End Stgn	K-Kills	End % Avail
B2010MX	3	3.0	0.0	99
B2011MX	30	19.8	4.8	79
B2012MX	30	23.8	2.5	86
B2013AR	14	13.4	0.1	96
B2020AR	3	3.0	0.0	99
B2021AR	14	6.9	1.6	56
B2022AR	14	12.9	0.0	92
B2023MX	30	25.1	0.8	86
B2030MX	3	3.0	0.0	99
B2031MX	30	27.7	0.0	92
B2032MX	30	28.2	0.1	94
B2033AR	14	8.4	1.6	68
Total Permanent Losses			11.5	

IFV/TOW Status
Table M-16

Unit ID	Initial Stgn	End Stgn	K-Kills	End % Avail
B201AA1	4	3.2	0.6	94
B201CA1	4	3.6	0.1	91
B201EA1	4	3.6	0.1	92
B201JA1	4	3.6	0.1	91
B201KA1	4	3.4	0.2	90
B201LA1	4	2.7	0.3	72
Total Permanent Losses			1.3	

SFV/STINGER Status
Table M-17

Unit ID	Initial Stgn	End Stgn	K-Kills	End % Avail
B2000DC	2	2.0	0.0	100
B2001DC	9	8.7	0.0	96
B2002DC	9	8.8	0.0	98
B2003DC	9	8.7	0.0	97
B2011DC	7	0.0	1.1	0
B2011MX	6	5.8	0.7	100
B2012MX	6	6.0	0.0	100
B2013AR	6	6.0	0.1	100
B2021AR	6	0.5	0.7	9
B2021DC	7	3.4	0.4	52
B2022AR	6	5.9	0.0	99
B2023MX	6	4.3	0.2	74
B2031DC	7	6.6	0.4	99
B2031MX	6	5.9	0.0	99
B2032MX	6	6.0	0.0	99
B2033AR	6	2.0	0.7	37
Total Permanent Losses			4.2	

FSV/45MM Status
Table M-18

Unit ID	Initial Stgn	End Stgn	K-Kills	End % Avail
B003IA1	6	5.8	0.0	97
B003JA1	6	5.8	0.0	97
B003KA1	6	6.0	0.0	100
B003LA1	6	0.0	1.6	0
B003MA1	6	6.0	0.0	100
B003NA1	6	6.0	0.0	100
B201BA1	6	4.8	1.2	100
B201DA1	6	0.0	1.5	0
B201FA1	6	5.9	0.0	98
B201GA1	6	6.0	0.0	100
B201HA1	6	6.0	0.0	100
B201IA1	6	5.8	0.0	97
Total Permanent Losses			4.3	

AVENGER Status
Table M-19

Unit ID	Initial Stgn	End Stgn	K-Kills	End % Avail
B200GM2	9	8.5	0.1	95
B200HM2	9	7.8	0.2	89
Total Permanent Losses			0.2	

MLRS D Status
Table M-20

Unit ID	Initial Stgn	End Stgn	K-Kills	End % Avail
B200AH2	6	5.0	0.0	83
B200BH2	6	4.7	0.2	81
B200CH2	6	5.0	0.0	84
B200DH2	6	5.6	0.0	94
B200EH2	6	5.1	0.0	86
B200FH2	6	3.4	1.1	69
B200JH2	6	5.6	0.0	94
B200KH2	6	5.4	0.6	99
B200LH2	6	5.6	0.1	94
Total Permanent Losses			1.9	

CRUSADER-D Status
Table M-21

Unit ID	Initial Stgn	End Stgn	K-Kills	End % Avail
B20L00H	15	6.9	4.3	64
Total Permanent Losses			4.3	

AH64D Status
Table M-22

Unit ID	Initial Stgn	End Stgn	K-Kills	End % Avail
B20L00H	9	4.9	2.4	75
B20S00H	16	16.9	1.3	100
Total Permanent Losses			3.7	

RAH66D Status
Table M-23

(3) CSS Workloads. The following CSS workloads are provided to show the type and magnitude of workload serviced by each unit.

(a) Recovery and evacuation vehicle workload. The second and third columns in table M-24 indicate the number of vehicles that required assisted recovery from their owning unit. The fourth through seventh columns show the number of vehicles that required evacuation 'in' and 'out' of a higher echelon maintenance unit; also indicated is whether or not the vehicle required a HET for evacuation.

Maint Unit	Total # of assisted recoveries		# EVAC'D IN		# EVAC'D OUT	
	HMTWRECKER	M88	TOTAL	w/ HET	TOTAL	w/ HET
B000000	264.6	245.2	37.0	19.1	0.0	0.0
B20000H	0.0	6.1	0.0	0.0	5.7	2.4
B2000AR	39.2	53.7	5.7	4.7	33.4	19.1
B2000DC	0.4	3.8	0.0	0.0	3.3	2.3
B2010MX	25.3	3.2	0.0	0.0	0.0	0.0
B2011MX	0.4	15.1	0.0	0.0	1.3	0.7
B2012MX	0.4	12.4	0.0	0.0	0.0	0.0
B2013AR	0.4	6.0	0.0	0.0	0.0	0.0
B2020AR	31.8	8.8	0.0	0.0	0.0	0.0
B2021AR	0.5	17.3	0.0	0.0	5.4	2.9
B2022AR	0.4	5.2	0.0	0.0	0.0	0.0
B2023MX	0.5	8.6	0.0	0.0	0.0	0.0
B2030MX	24.6	1.6	0.0	0.0	0.0	0.0
B2031MX	0.4	5.1	0.0	0.0	0.0	0.0
B2032MX	0.4	5.3	0.0	0.0	0.0	0.0
B2033AR	0.5	21.0	0.0	0.0	8.1	3.2
B20L00H	0.6	0.0	0.0	0.0	0.0	0.0
B20S00H	0.6	0.0	0.0	0.0	0.0	0.0

Recovery and Evacuation Workload
Table M-24

(b) Medical team workload. Table M-25 shows the number of personnel that arrived at a medical facility during the scenario due to combat and non-combat (DNBI) actions. The last column displays the number of treatment man hours expended by all medical teams.

MEDICAL UNIT	CBT MEDICAL RECOVERED	DNBI MEDICAL RECOVERED	MMH EXPENDED	MEDICAL UNIT	CBT MEDICAL RECOVERED	DNBI MEDICAL RECOVERED	MMH EXPENDED
B000000	906	1,027	5,380.1	B2021AR	7	31	76.9
B20000H	0	13	27.5	B2022AR	0	34	73.6
B2000AR	1	281	334.8	B2023MX	2	37	83.7
B2000DC	1	30	66.8	B2030MX	1	29	64.7
B20020H	0	17	36.9	B2031MX	0	39	84.2
B2010MX	1	29	65.5	B2032MX	2	38	84.8
B2011MX	4	37	87.2	B2033AR	3	33	75.9
B2012MX	0	39	85.3	B20L00H	4	18	56.2
B2013AR	3	32	73.5	B20S00H	1	13	42.5
B2020AR	0	31	68.6				

Medical Unit Workload
Table M-25

(c) Maintenance team workload. Table M-26 shows the number of vehicles (both ground and air) that were recovered to a maintenance facility during the scenario. The last four columns display the number of maintenance man hours expended on ground and air vehicles and the estimated number of maintenance man hours required at TP 10 to repair all vehicles at the maintenance facilities.

MAINT UNIT	# VEHICLES RECOVERED		GROUND VEHICLES		HELICOPTERS	
	CBT DAMAGE	RAM DAMAGE	MMH EXPENDED	MMH NEEDED	MMH EXPENDED	MMH NEEDED
CORPS(R)	114.7	633.5	2,863.0	1,441.9	12.2	0.6
CORPS(F)	44.7	59.0	628.2	1,377.9		
B20000H(AVIM)	0.0	15.5	34.7	9.5	42.8	2.5
B2000AR	1.4	172.9	277.5	121.5		
B2000DC	3.0	12.8	38.3	1.4		
B20020H	0.0	5.6	2.0	0.0	23.3	1.5
B2010MX	30.1	47.0	151.8	8.8		
B2011MX	25.3	11.7	132.1	0.6		
B2012MX	13.6	11.9	101.5	3.4		
B2013AR	2.8	12.8	60.4	4.5		
B2020AR	33.8	47.2	183.7	43.0		
B2021AR	35.6	11.2	140.1	4.1		
B2022AR	0.0	12.4	52.3	4.4		
B2023MX	10.4	13.1	76.7	5.6		
B2030MX	5.3	45.1	86.2	2.2		
B2031MX	0.0	13.1	46.4	3.8		
B2032MX	1.7	13.2	49.3	3.9		
B2033AR	33.3	11.2	136.2	14.7		
B20L00H	0.1	22.6	2.5	0.0	62.5	0.5
B20S00H	0.1	27.0	2.0	0.0	112.3	1.7

Maintenance Unit Workload
Table M-26

(4) Observations.

- 1) The automotive and armament mechanics in the CSB(DS) could not handle the produced workload.
- 2) With the exception of the number of mechanics at the 1st Bn, 2nd Bde (Armor) Task Force, the CSS system did not constrain weapon system availability.

6. Supply Analysis.

a. This analysis assesses the CSS system's capability to support combat and combat support units for the defined scenario. The CSS units must fill requests for replenishment stockages in a "timely fashion"; failure to do so can be attributed to lack of transporters, lack of stockages, long order-to-delivery times, or a combination of the three.

b. Analysis. This analysis is structured into two parts: supply class III and supply class V.

(1) Supply Class III.

(a) Requirement. For the scenario, the requirement for class III (petroleum) was found by summing the consumption (quantities "used" plus quantities "lost") of all maneuver units (CSS units were excluded from this computation) during each TP. Calculated in "gallons (gals)," the requirement for class III for the length of the scenario is presented in table L-1.

The consumption of supplies generates a requirement for stocks of supply types as well as transportation assets to deliver the replenishments to maneuver unit stockages. Consumption is translated into an order for materiel. Each order levies upon the CSS system a requirement for existing stocks and transportation assets. The authorized amount declines with time due to the attrition of weapon systems. Each weapon system has an authorized amount of specific supply types, and the authorized stockage is reduced as systems are killed. Table L-1 identifies the area of operation (AO) stockage levels and activities for class III: 1) amounts used; 2) amounts lost; and 3) amounts consumed (the requirement).

TP	USED GALS	LOST GALS	REQUIREMENT CONSUMED
0	0	0	0
1	115,957	0	115,957
2	90,829	5	90,834
3	73,546	0	73,546
4	93,922	0	93,922
5	59,091	0	59,091
6	110,160	2,677	112,837
7	90,799	2,483	93,282
8	51,789	4,101	55,890
9	36,099	1,247	37,346
10	38,968	3,538	42,506
11	26,290	157	26,448
12	36,036	72	36,108
TOTAL	823,487	14,281	837,768

Consumption of Class III, GALS
Table L-1

(b) Discussion. The resupply options for maneuver units are: 1) resupply is unnecessary (Balance on Hand $\geq 75\%$ of Authorized); 2) standard resupply (Balance on Hand $\geq 50\%$ & $< 75\%$ of Authorized); or 3) emergency resupply (Balance on Hand $< 50\%$ of Authorized); reference Appendix B for definitions of "standard" and "emergency" resupply. Table L-2 indicates during which TP(s) any maneuver unit(s) may have a BOH so low as to warrant the use of either standard or emergency resupply.

	TP												
RESUPPLY	0	1	2	3	4	5	6	7	8	9	10	11	12
RESUPPLY UNNEC	104	96	64	86	67	89	77	68	84	83	72	90	87
STANDARD RESUPPLY	0	8	39	18	30	13	22	24	17	17	26	9	13
EMERGENCY RESUPPLY	0	0	1	0	7	2	3	10	1	1	3	2	0
ALL UNITS ¹	104	104	104	104	104	104	102	102	102	101	101	101	100
¹ COMBAT INEFFECTIVE (DEAD) UNITS ARE NOT INCLUDED.													

Number of Maneuver Units Needing Resupply, Class III
Table L-2

For more detail on individual units requiring resupply see table L-3 below. These units wait an average of 4.5 TPs (median of 4 TPs) before their BOH returns to a level no longer requiring resupply of class III.

	TP													
Unit	0	1	2	3	4	5	6	7	8	9	10	11	12	#TPs
B000000					71	72	73	73	75			69	70	7
B0002EN													75	1
B0008EN											73			1
B00A1M2			69		68		70			72	72			5
B00A2M2			70		69		72		75	71	72			6
B00A3M2			69		68		71			71	70			5
B00A4M2			70		71			59					72	4
B00A5M2			70		68		70		75	73	72			6
B00A6M2			70		69		70		74	71	69			6
B00A7M2			70		68		72			72	70			5
B00A8M2			70		67		70				74			4
B00A9M2			70		68		72		73	69				5
B00B1M2			71		70							73		3
B00B2M2			71		71							73		3
B00B3M2			71		70							73		3
B00B4M2			71		71							74		3
B00B5M2			71		69						73			3
B00B6M2			72		71									2
B00BAH2			66		62					74				3
B00BBH2			67		61					73				3
B00BCH2			66		64									2
B00C1M2								62					74	2
B00C2M2								62			74			2
B00C3M2								61						1
B00C4M2								62						1
B00C5M2								63						1
B00C6M2								62						1
B00CAH2								58		74	73			3
B00CBH2								57		74	72			3
B00CCH2								57		74	72			3
B00H00H							73							1
B20000H												75		1
B2000AR				69	51	46	32	17	11	7	6	4	0	10
B2000DC							74							1
B2001DC			72	64				68						3

Unit	TP													#TPs
	0	1	2	3	4	5	6	7	8	9	10	11	12	
B2002DC			72	63		72		73	65					5
B2003DC			73	66		71			69	62				5
B200AH2			67					69	63					3
B200BH2			67		63		63	75	65					5
B200CH2			65					72	64					3
B200DH2			62					67	58		69			4
B200EH2			62	75				65			63			4
B200FH2			63					74	64		74		75	5
B200GM2			69		71		73			74	72			5
B200HM2			70		71			59			74			4
B200JH2			61	70	54	72		65			61			6
B200KH2			63	70	53			64			72			5
B200LH2			61	70	53	73		65			62			6
B2010MX					72							74		2
B2011MX		72		70	45	65	60	42	63				53	8
B2012MX		73		69	43	65	63	46			47			7
B2013AR		71		66	39	57	57	32	67				67	8
B2020AR			71				74	60		70	57			5
B2021AR		73	73	51	66	50	53	31						7
B2022AR		72	73	52	67	51	54	33		70	59	52	66	11
B2023MX			53	61	46	59	33	43	57		59		74	9
B2030MX			72	56	40		69						73	5
B2031MX		75	51	55	32	54	56	35	60	50	49	43	61	12
B2032MX		73	49	55	35	54	54	33	57		61		72	10
B2033AR		73	71	54	63	52	48	31			66	73	71	10
TOTAL		8	40	18	37	15	25	34	18	18	29	11	14	

Percentage of Balance On-Hand (%) for Maneuver Units
Requiring Resupply, Class III
Table L-3

For example, at the end of TP 6, B2000DC had a class III BOH of 74%. This was the only TP in which B2000DC could have asked for resupply. During TP 6, B2000DC was one of 25 units that requested resupply.

(c) Problems. Table L-3 shows BOH percentage for individual maneuver units requiring resupply. However, a review of individual orders revealed a problem with the availability of replenishments and transporters (reference table L-4); problem areas have been shaded for easy identification. The "Trucks Avail" refers to the number of transporters available to convey the order; and "Avail Stocks" refers to the amount of class III at a supply unit after an attempt to fill the order.

TP	REQ'ING UNIT	SUPPLY UNIT	SUPPLY TYPE	AMOUNT REQUESTED GALS	AMOUNT SHIPPED GALS	AMOUNT SHORTED (%)	TRUCKS AVAIL	AVAIL STOCKS GALS
4	B000000	B001POL	POL-B	7,763	2,490	67.9	0	3,074,561
5	B000000	B001POL	POL-B	7,586	2,495	67.1	0	3,072,066.3
6	B2033AR	B2033FC	POL-B	5,908	4,155	29.7	3.8	0
6	B2013AR	B2013FC	POL-B	5,750	3,267	43.2	5.1	0
6	B2021AR	B2021FC	POL-B	6,934	2,001	71.1	4.8	0
6	B2022AR	B2022FC	POL-B	6,313	2,120	66.4	3.7	0

TP	REQ'ING UNIT	SUPPLY UNIT	SUPPLY TYPE	AMOUNT REQUESTED GALS	AMOUNT SHIPPED GALS	AMOUNT SHORTED (%)	TRUCKS AVAIL	AVAIL STOCKS GALS
6	B2031MX	B2031FC	POL-B	5,513	1,820	67.0	8.8	0
6	B2032MX	B2032FC	POL-B	5,586	1,778	68.2	3.8	0
6	B2011MX	B2011FC	POL-B	5,194	2,921	43.8	6.3	0
6	B2012MX	B2012FC	POL-B	4,742	2,816	40.6	6.3	0
6	B2023MX	B2023FC	POL-B	4,480	1,782	60.2	5	0
6	B000000	B001POL	POL-B	7,967	2,495	68.7	0	3,061,016
7	B2021AR	B2021FC	POL-B	11,364	6,106	46.3	0	7,276.6
7	B2022AR	B2022FC	POL-B	11,205	5,513	50.8	0	241.9
7	B2031MX	B2031FC	POL-B	8,235	5,042	38.8	8.8	0
7	B2033AR	B2033FC	POL-B	10,405	5,496	47.2	0	6,384
7	B000000	B001POL	POL-B	7,831	2,500	68.1	0	3,058,516
7	B2013AR	B2013FC	POL-B	12,029	5,459	54.6	3.8	0
7	B2023MX	B2023FC	POL-B	7,953	3,726	53.1	5.1	0
7	B2032MX	B2032FC	POL-B	9,745	4,609	52.7	4.8	0
8	B2021AR	B2021FC	POL-B	8,181	6,986	14.6	0	1,601.3
8	B2013AR	B2013FC	POL-B	6,813	1,268	81.4	8.8	0
8	B2032MX	B2032FC	POL-B	7,569	5,138	32.1	3.8	0
8	B2023MX	B2023FC	POL-B	4,346	3,756	13.6	6.3	0
9	B2011MX	B2011FC	POL-B	5,016	4,141	17.4	0	4,789
9	B000000	B001POL	POL-B	7,812	2,496	68.0	0	3,055,581.5
9	B2022AR	B2022FC	POL-B	6,781	1,492	78.0	7	0
9	B2031MX	B2031FC	POL-B	8,403	3,799	54.8	4	0
10	B000000	B001POL	POL-B	7,629	2,498	67.3	0	3,052,906
10	B2023MX	B2023FC	POL-B	4,233	3,615	14.6	8.8	0
10	B2032MX	B2032FC	POL-B	4,364	4,334	0.7	8.8	0
11	B000000	B001POL	POL-B	7,911	2,495	68.5	0	3,050,205.8
11	B2031MX	B2031FC	POL-B	9,324	4,004	57.1	6.3	0
11	B2022AR	B2022FC	POL-B	10,191	4,680	54.1	4.7	0
11	B2033AR	B2033FC	POL-B	4,699	40	99.2	3	0
12	B000000	B001POL	POL-B	7,696	2,499	67.5	0	3,047,855
12	B2011MX	B2011FC	POL-B	5,751	4,789	16.7	4	0
12	B2022AR	B2022FC	POL-B	6,648	5,328	19.9	1.2	0
12	B2013AR	B2013FC	POL-B	6,704	940	86.0	8.8	0
	TOTAL			282,573	132,887	53.0		

Problems Filling Maneuver Unit Orders, Class III
Table L-4

To quantify a measure of risk, the maximum consumption of class III by a unit for any TP is compared with the current BOH for each TP; if the value is less than one, the unit would exhaust its supplies prior to repeating the activities of this "maximum" TP. Where "at risk" is less than one TP of supply, class III was generally provided to maneuver units without placing them "at risk". Two maneuver units were "at risk". See Table L-5.

	TP													
MANEUVER UNIT	0	1	2	3	4	5	6	7	8	9	10	11	12	# of TPs
B2000AR								1	1	1	1	1	1	6
B2033AR								1						1

"At Risk" Units, Class III Risk
Table L-5

(d) Observation.

- 1) 10 percent (10 out of 104) of the maneuver units required emergency replenishment of Class III in TP 7.
- 2) 67 percent (26 out of 39) of the problems filling maneuver unit orders are attributable to the unavailability of Class III stockage.
- 3) 33 percent (13 out of 39) of the problems filling maneuver unit orders is attributed to the unavailability of Class III transporters.

(2) Supply Class V.

(a) Requirement. For the scenario, the requirement for class V (ammunition) was found by summing the consumption (quantities "used" plus quantities "lost") of all maneuver units (CSS units were excluded from this computation) during each of the 4-hour TPs. Calculated in "short tons (stons)," the requirement for class V for the length of the scenario is presented in table L-6.

TP	USED STONS	LOST STONS	REQUIREMENT CONSUMED
0	0	0	0
1	1,305	0	1,305
2	1,426	0	1,426
3	239	0	239
4	181	0	181
5	374	0	374
6	139	17	156
7	613	7	620
8	1,573	35	1,608
9	894	35	929
10	453	18	472
11	201	2	203
12	59	1	60
TOTAL	7,459	115	7,574

Consumption of Class V, STONS
Table L-6

(b) Discussion.

1) This analysis focuses on thirteen munition types {155MM, ATACMS, MLRS, Hellfire, Longbow, 2.75RKT, Patriot, Stinger, 120MM, 25MM, Javelin, LAW, and TOWII} using five indices {Amount Authorized, Amount On-Hand, Amount Used, Amount Lost, and Ratio of Amount On-Hand to Amount Authorized}. A list of all corps and division assets

listing VIC unit name designators and their actual unit names is contained in Appendix A. A list of all supply analysis definitions is contained in Appendix B.

a) The thirteen aforementioned munition types were grouped into six functional categories (Field Artillery, Aviation, Air Defense Artillery, Armor & Mechanized Infantry, Anti-Armor, and Anti-Tank). Each of the functional categories was divided into subcategories displayed in table L-7:

Category	Member Munition Type
Field Artillery	155MM - {M107 (CB), M116B1, M121A1, M449A1, M483A1, M549A1, M692/M731, M795, M825, M864, M864/AR, M864/GM, XM898, XM898/AR, XM898/GM, XM982, XM982/GM} ATACMS - {ATACMS-I, ATACMS-IA, ATACMS-II, ATACMS-IIA} MLRS - {ER-MLRS, ER-MLRS/GUIDED, M26, MSTAR}
Aviation	HELLFIRE, LONGBOW, 2.75RKT
Air Defense Artillery (ADA)	PATRIOT, STINGER
Armor & Mechanized Infantry	120MM - {120MM, PGMM, M929, M933}
Anti-Armor	25MM - {25MM, 40MM, 45MM}
Anti-Tank	JAVELIN, LAW, TOWII

Key Functional Categories
Table L-7

b) Table L-8 displays the key munition types with the five aforementioned indices for each key munition at the end of the scenario. **The scenario end states shown are reliable indicators of individual unit supply status over the course of the scenario:**

c) Table L-8 represents an aggregation by munition type for all units in the modeled force. However, supply performance at some individual units for specific munitions varied significantly from these general indicators.

- The first column, key munition type, lists each of the munition types included for analysis in this report.

- The second column, amount authorized indicates quantities at initial state (TP 0) of the scenario.

- The total amount used of a key munition type (column three) can exceed the endstate BOH because during a particular TP a unit can receive a key munition type.

- Munitions lost due to combat activity (column four) did not cause any significant inventory imbalances resulting in availability shortfalls.

- The fifth and sixth columns, amount authorized and balance on hand (BOH) respectively, indicate quantities at endstate (TP 12) of the scenario.

- The seventh column, percentage of balance on hand of amount authorized, indicates that at endstate (TP 12) of the scenario, the quantity of munitions available for mission support was large and more than sufficient to meet requirements. **The Balance on Hand was at least one hundred percent of authorized for each munition type except (155MM, ATACMS, and MLRS).**

Key Munition Type	Initial State	Consumption		Endstate		
	Amt Authorized (Rounds) @ TP0	Total Amount Used (Rounds)	Total Amount Lost (Rounds)	Amt Authorized (Rounds) @ TP12	BOH @ TP12 (Rounds)	Percentage BOH of Authorized
155MM	31,050	22,009	499	27,205	14,704	54%
ATACMS	531	531	0	463	0	0%
MLRS	15,525	12,014	62	13,040	6,078	47%
HELLFIRE	720	0	0	480	720	150%
Longbow	1,920	446	21	1,275	1,650	129%
2.75RKT	13,680	0	0	9,014	13,680	152%
Patriot	120	0	0	109	120	110%
STINGER	1,368	86	11	1,037	1,210	117%
120MM	12,160	302	137	9,915	11,856	120%
25MM	367,740	5,745	33,085	303,914	328,910	108%
JAVELIN	390	25	7	345	357	103%
LAW	2,189	0	21	2,038	2,153	106%
TOWII	1,505	79	40	1,229	1,385	113%

Key Munition Status
Table L-8

d) Table L-9 provides an overall summary of the additional supply indicators which help assess the sufficiency of munition availability. Although the indicators are shown by munition type, the individual indicators represent the presence (Yes) or absence (No) of that indicator for some specific unit(s) in the force at the end of a specific TP. Tables L-10 thru L-23 provide more detailed analyses of the aforementioned munition availability criteria.

Key Munition Type	BOH(>=75%)	Standard Replenishment BOH(50%-74%)	Emergency Replenishment BOH(1%-49%)	BOH(=0)
155MM	Yes	Yes	Yes	Yes
ATACMS	Yes	No	Yes	Yes
MLRS	Yes	Yes	Yes	Yes
HELLFIRE	Yes	No	No	No
Longbow	Yes	Yes	No	No
2.75RKT	Yes	No	No	No
Patriot	Yes	No	No	No
STINGER	Yes	Yes	No	No
120MM	Yes	Yes	Yes	Yes
25MM	Yes	No	No	No
JAVELIN	Yes	No	Yes	No
LAW	Yes	No	No	No
TOWII	Yes	No	No	No

Balance on Hand Status
Table L-9

- Balance on Hand (>=75%) of Authorized: Initially all units start in this range since the amount authorized is equal to the balance on hand. BOHs which remain in this range maintain a sufficient quantity of authorized munitions and at no time throughout the scenario require supply replenishment.

- Balance on Hand (50%-74%) of Authorized: This column indicates whether or not the BOH by munition type at any unit fell to the indicated percentage range of the authorized amount. BOH in this range triggers "standard supply replenishment" requests.

-- For eight of the munition types (ATACMS, HELLFIRE, 2.75RKT, PATRIOT, 25MM, JAVELIN, LAW, and TOWII) no standard supply replenishment was required at any time during the scenario. No HELLFIRE, 2.75RKT, PATRIOT, or LAW munition type was expended during this scenario. Also, no ATACMS, HELLFIRE, 2.75RKT or PATRIOT munition type was lost due to attrition of systems.

-- The other five munition types (155MM, MLRS, LONGBOW, STINGER, and 120MM) triggered standard resupply orders at some specific unit. Tables L-10 through L-14 identify the unit, the time period, and the sub-munition(s) which triggered a standard resupply order.

Unit Name	BOH(50%-74%)	Time Period(TP)	Sub-munition
A BTY 4TH BN 2ND BDE X CORPS ARTY	71%	TP 2	M795
B BTY 4TH BN 2ND BDE X CORPS ARTY	71%	TP 5	M795
C BTY 4TH BN 2ND BDE X CORPS ARTY	71% 54% 64% 63% 53%	TP 2 & 3 TP 4 - 8,10 11,12 TP 4,7,10,11,12 TP 5,6,8,9 TP 9	M795 M107(CB) XM898 XM898 M107(CB)
A BTY 4TH BN 3RD BDE X CORPS ARTY	68% 75% 67% 59% 50%	TP 7 TP 9 TP 10 TP 11 TP 12	XM898 XM982 XM982 XM982 XM982
B BTY 4TH BN 3RD BDE X CORPS ARTY	73% 71% 52% 61% 60% 51% 51%	TP 10 TP 10 TP 11 TP 11 TP 12 TP 12 TP 12	M864 XM982 M864 XM982 M107(CB) M864 XM982
C BTY 4TH BN 3RD BDE X CORPS ARTY	75% 69% 67% 70% 59% 51%	TP 9 TP 10 TP 10 TP 11 & 12 TP 11 TP 12	XM982 M864 XM982 M864 XM982 XM982
1 BN-A 155SP BTRY (HIP) EXFOR DIVARTY	57% 70% 53% 54% 63% 64% 71%	TP 2 TP 2 TP 3,4,6,7 TP 5 & 8 TP 11 TP 12 TP 12	M483A1 M795 M107(CB) M107(CB) XM982 XM982 M795
1 BN-B 155SP BTRY (HIP) EXFOR DIVARTY	70%	TP 2	M795
1 BN-C 155SP BTRY (HIP) EXFOR DIVARTY	70%	TP 2	M795
2 BN-A 155SP BTRY (HIP) EXFOR DIVARTY	63% 62% 69% 56% 55%	TP 3,4,5,7 TP 6 TP 9 TP 11 TP 12	M483A1 M483A1 XM898 XM898 XM898
2 BN-B 155SP BTRY (HIP) EXFOR DIVARTY	62% 63% 65%	TP 3,4,5,6 TP 7 TP 8	M483A1 M483A1 M107(CB)
2 BN-C 155SP BTRY (HIP) EXFOR DIVARTY	63% 62% 64%	TP 3,4,5 TP 6 TP 7	M483A1 M483A1 M483A1
5 BN-B 155SP BTRY (HIP) EXFOR DIVARTY	66% 67%	TP 9 TP 10	M864 M864

155MM Standard Replenishment
Table L-10

Unit Name	BOH(50%-74%)	Time Period(TP)	Sub-munition
A BTY 1ST BN 1ST BDE X CORPS ARTY (MLRS)	66%	TP 2	M26
B BTY 1ST BN 1ST BDE X CORPS ARTY (MLRS)	73%	TP 3	M26
	57%	TP 8	M26
	58%	TP 12	M26
C BTY 1ST BN 1ST BDE X CORPS ARTY (MLRS)	66%	TP 8	M26
	57%	TP 12	M26
A BTY 2ND BN 1ST BDE X CORPS ARTY (MLRS)	59%	TP 3 & 6	ER-MLRS/GUIDE
	60%	TP 4 & 5	ER-MLRS/GUIDE
	69%	TP 8	M26
	68%	TP 10	M26
	71%	TP 11	M26
B BTY 2ND BN 1ST BDE X CORPS ARTY (MLRS)	67%	TP 1	ER-MLRS/GUIDE
	68%	TP 2	ER-MLRS/GUIDE
	72%	TP 8	M26
	62%	TP 9	M26
	59%	TP 10	M26
C BTY 2ND BN 1ST BDE X CORPS ARTY (MLRS)	60%	TP 11	M26
	67%	TP 1	ER-MLRS/GUIDE
	68%	TP 2	ER-MLRS/GUIDE
A BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)	71%	TP 7	ER-MLRS/GUIDE
	67%	TP 1 & 2	ER-MLRS/GUIDE
B BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)	59%	TP 3, 6, 7	ER-MLRS/GUIDE
	60%	TP 4 & 5	ER-MLRS/GUIDE
C BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)	67%	TP 1	ER-MLRS/GUIDE
	68%	TP 2	ER-MLRS/GUIDE
A BTY 1ST BN 2ND BDE X CORPS ARTY	62%	TP 6	ER-MLRS/GUIDE
	62%	TP 6	ER-MLRS
	63%	TP 7	ER-MLRS/GUIDE
	63%	TP 7	ER-MLRS
C BTY 1ST BN 2ND BDE X CORPS ARTY	68%	TP 6	ER-MLRS/GUIDE
	68%	TP 6	ER-MLRS
C BTY 2ND BN 2ND BDE X CORPS ARTY	73%	TP 2	M26
A BTY 1ST BN 3RD BDE X CORPS ARTY	56%	TP 9	M26
	51%	TP 10	ER-MLRS
	74%	TP 12	M26
A BTY 2ND BN 3RD BDE X CORPS ARTY	53%	TP 9	ER-MLRS/GUIDE
B BTY 2ND BN 3RD BDE X CORPS ARTY	74%	TP 7	M26
	55%	TP 9	ER-MLRS/GUIDE
4 BN-A MLRS BTY EXFOR DIVARTY	66%	TP 2	MSTAR
	62%	TP 3, 4, 5, 6	MSTAR
	59%	TP 7	MSTAR

MLRS Standard Replenishment
Table L-11

Unit Name	BOH(50%-74%)	Time Period(TP)	Sub-munition
1 BN ATK EXFOR AV	70%	TP 11	Longbow

Longbow Standard Replenishment
Table-12

Unit Name	BOH(50%-74%)	Time Period(TP)	Sub-munition
B003IA1: AVENGER PLT 10th CORPS	58%	TP 5 - 12	STINGER
B003NA1: AVENGER PLT 10th CORPS	75%	TP 5 - 12	STINGER

STINGER Standard Replenishment
Table-13

Unit Name	BOH(50%-74%)	Time Period(TP)	Sub-munition
B2001DC: A Trp DIVISION CAV SQDRN	61%	TP 9	PGMM
	54%	TP 10	PGMM
B2002DC: B Trp DIVISION CAV SQDRN	62%	TP 10,11,12	PGMM

120MM Standard Replenishment
Table L-14

- Balance on Hand (1%-49%) of Authorized: This column indicates whether or not the BOH by munition type at any unit fell to the indicated percentage range of the authorized amount. BOH in this range triggers "emergency supply replenishment" requests. Five of the munition types (155MM, ATACMS, MLRS, 120MM and JAVELIN) required emergency resupply. Tables L-15 through L-19 depict specific unit, time period, and sub-munition type which generate an emergency resupply request.

Unit Name	BOH(1%-49%)	Time Period(TP)	Sub-munition
A BTY 4TH BN 2ND BDE X CORPS ARTY	3%	TP 2 & 3	XM898
	29%	TP 4,5,7,8,10,11,12	XM898
	28%	TP 6 & 9	XM898
	25%	TP 3 - 12	M107(CB)
	9%	TP 2	M864
	34%	TP 3 - 12	M864
	25%	TP 3 & 4	M483A1
B BTY 4TH BN 2ND BDE X CORPS ARTY	8%	TP 1 & 2	M864
	3%	TP 2 & 3	XM898
	29%	TP 4,5,7,10	XM898
	28%	TP 6,8,9,11,12	XM898
	25%	TP 3 & 4	M483A1
	25%	TP 3 - 12	M107(CB)
C BTY 4TH BN 2ND BDE X CORPS ARTY	8%	TP 1	M864
	9%	TP 2	M864
	38%	TP 2 & 3	XM898
	25%	TP 3 & 4	M483A1
A BTY 4TH BN 3RD BDE X CORPS ARTY	10%	TP 6	M864
	27%	TP 7	M107(CB)
	28%	TP 7	XM982
	20%	TP 8	XM982
	6%	TP 8,9,10	M107(CB)
	15%	TP 8	XM898
	21%	TP 8	M549A1
	5%	TP 9 & 10	XM898
	7%	TP 8,9,10	M549A1
	37%	TP 11 & 12	XM898
	31%	TP 11 & 12	M107(CB)
B BTY 4TH BN 3RD BDE X CORPS ARTY	35%	TP 5	M483A1
	32%	TP 7	M864
	28%	TP 7	XM982
	6%	TP 8 - 11	M107(CB)
	20%	TP 8	M549A1
	12%	TP 8	M864
	12%	TP 8	XM898
	20%	TP 8	XM982
	4%	TP 9,10,11	M549A1
	7%	TP 9	XM898
	2%	TP 10	XM898
	1%	TP 11	XM898
	27%	TP 12	XM898
	41%	TP 12	M549A1

Unit Name	BOH(1%-49%)	Time Period(TP)	Sub-munition
C BTY 4TH BN 3RD BDE X CORPS ARTY	35% 32% 37% 6% 20% 11% 13% 19% 5% 3% 33% 31%	TP 5 TP 7 TP 7 TP 8 - 11 TP 8 TP 8 TP 8 TP 8 TP 9,10,11 TP 9,10,11 TP 12 TP 12	M483A1 M864 XM982 M107 (CB) M549A1 M864 XM898 XM982 M549A1 XM898 XM898 M107 (CB)
1 BN-A 155SP BTRY (HIP) EXFOR DIVARTY	16% 14% 2% 5% 30% 21% 27% 50% 8% 9% 13% 14%	TP 8 TP 8,9,12 TP 2 TP 9 & 10 TP 9 TP 10,11,12 TP 10 TP 10 TP 10 TP 11 & 12 TP 11 TP 12	M483A1 M864 M483A1 M549A1 XM982 M483A1 M864 XM898 XM982 M549A1 M864 M864
1 BN-B 155SP BTRY (HIP) EXFOR DIVARTY	11% 36% 36% 37% 37% 14% 23% 2% 20% 6%	TP 2 TP 3 & 6 TP 3,5,6,8 TP 4,5,7 TP 4 & 7 TP 9 TP 10 TP 11 & 12 TP 11 & 12 TP 11 & 12	M483A1 M483A1 M107 (CB) M483A1 M107 (CB) M864 M864 M549A1 M864 XM982
1 BN-C 155SP BTRY (HIP) EXFOR DIVARTY	25% 17% 14% 43% 39% 12% 44% 25%	TP 3 - 8 TP 8 & 9 TP 8 & 9 TP 10 & 11 TP 10 TP 11 & 12 TP 12 TP 12	M107 (CB) M483A1 M864 M483A1 M864 M864 M483A1 XM982
2 BN-A 155SP BTRY (HIP) EXFOR DIVARTY	5% 44% 6% 33% 27% 38% 20% 24% 8% 33%	TP 8 TP 8 TP 9 TP 9 TP 9 TP 10,11,12 TP 10,11,12 TP 10 TP 10 TP 11 & 12	M107 (CB) M864 M107 (CB) M864 XM982 M107 (CB) M864 XM898 XM982 XM982
2 BN-B 155SP BTRY (HIP) EXFOR DIVARTY	18% 20% 2% 37%	TP 8 & 9 TP 10,11,12 TP 10,11,12 TP 11 & 12	M864 M864 XM982 M107 (CB)
2 BN-C 155SP BTRY (HIP) EXFOR DIVARTY	2% 18% 46% 47% 19%	TP 8,9,11,12 TP 8 & 9 TP 10 TP 11 & 12 TP 11 & 12	M483A1 M864 M864 M107 (CB) M864
5 BN-A 155SP BTRY (HIP) EXFOR DIVARTY	25% 36% 37%	TP 4,5,6,7 TP 4 - 9 TP 10	M483A1 M864 M864
5 BN-B 155SP BTRY (HIP) EXFOR DIVARTY	25% 36% 27% 39% 21%	TP 4,5,6,7 TP 4,5,6,7 TP 8 TP 9 TP 10	M483A1 M864 M483A1 M864 M483A1

Unit Name	BOH(1%-49%)	Time Period(TP)	Sub-munition
5 BN-C 155SP BTRY (HIP) EXFOR DIVARTY	25%	TP 4,5,6,7	M483A1
	26%	TP 8 & 9	M483A1

155MM Emergency Replenishment
Table L-15

Unit Name	BOH(1%-49%)	Time Period(TP)	Sub-munition
A BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)	7%	TP 1	ATACMS-IA
	8%	TP 2	ATACMS-IA
C BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)	49%	TP 1 & 2	ATACMS-IA
A BTY 1ST BN 2ND BDE X CORPS ARTY	19%	TP 3	ATACMS-IA
B BTY 1ST BN 2ND BDE X CORPS ARTY	19%	TP 3	ATACMS-IA
C BTY 1ST BN 2ND BDE X CORPS ARTY	26%	TP 3	ATACMS-IA
A BTY 1ST BN 3RD BDE X CORPS ARTY	22%	TP 5	ATACMS-II

ATACMS Emergency Replenishment
Table L-16

Unit Name	BOH(1%-49%)	Time Period(TP)	Sub-munition
A BTY 1ST BN 1ST BDE X CORPS ARTY (MLRS)	34%	TP 1	ER-MLRS/Guide
	25%	TP 3	ER-MLRS
	26%	TP 3,4,5,6	ER-MLRS/Guide
	1%	TP 3	M26
	31%	TP 4,5,6,7	M26
B BTY 1ST BN 1ST BDE X CORPS ARTY (MLRS)	34%	TP 1	ER-MLRS/Guide
	25%	TP 3	ER-MLRS
	26%	TP 3,4,5,6	ER-MLRS/Guide
	32%	TP 9	M26
	17%	TP 10 & 11	M26
C BTY 1ST BN 1ST BDE X CORPS ARTY (MLRS)	34%	TP 1	ER-MLRS/Guide
	25%	TP 3	ER-MLRS
	26%	TP 3,4,5,6	ER-MLRS/Guide
	42%	TP 9	M26
	26%	TP 10 & 11	M26
A BTY 2ND BN 1ST BDE X CORPS ARTY (MLRS)	34%	TP 1 & 2	ER-MLRS/Guide
	25%	TP 3	ER-MLRS
	2%	TP 7,9,11	ER-MLRS/Guide
	1%	TP 8	ER-MLRS/Guide
B BTY 2ND BN 1ST BDE X CORPS ARTY (MLRS)	25%	TP 3	ER-MLRS
	7%	TP 4,5,6	ER-MLRS
	33%	TP 7	ER-MLRS/Guide
	25%	TP 8 & 9	ER-MLRS/Guide
	14%	TP 10	ER-MLRS/Guide
	2%	TP 11 & 12	ER-MLRS/Guide
C BTY 2ND BN 1ST BDE X CORPS ARTY (MLRS)	25%	TP 3 - 7	ER-MLRS
	25%	TP 8	ER-MLRS/Guide
	22%	TP 9	ER-MLRS/Guide
	12%	TP 10	ER-MLRS/Guide
	2%	TP 11 & 12	ER-MLRS/Guide
A BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)	25%	TP 3 - 7	ER-MLRS
	25%	TP 8	ER-MLRS/Guide
	22%	TP 9	ER-MLRS/Guide
	12%	TP 10	ER-MLRS/Guide
B BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)	34%	TP 1 & 2	ER-MLRS/Guide
	25%	TP 3 - 7	ER-MLRS
	1%	TP 9 & 12	ER-MLRS
C BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)	25%	TP 3 - 7	ER-MLRS
	25%	TP 8	ER-MLRS/Guide
	20%	TP 9	ER-MLRS/Guide
	11%	TP 10	ER-MLRS/Guide
	3%	TP 11	ER-MLRS/Guide
	1%	TP 12	ER-MLRS/Guide

Unit Name	BOH(1%-49%)	Time Period(TP)	Sub-munition
A BTY 1ST BN 2ND BDE X CORPS ARTY	31% 25% 25% 32% 32% 26% 26% 24% 24% 23% 23%	TP 2 TP 3,4,5,9 TP 3,4,5,9 TP 8 TP 8 TP 10 TP 10 TP 11 TP 11 TP 12 TP 12	M26 ER-MLRS ER-MLRS/Guide ER-MLRS ER-MLRS/Guide ER-MLRS ER-MLRS/Guide ER-MLRS ER-MLRS/Guide ER-MLRS ER-MLRS/Guide
B BTY 1ST BN 2ND BDE X CORPS ARTY	25% 25% 26% 26%	TP 3,4,5,7,9,10,12 TP 3,4,5,7,9,10,12 TP 6,8,11 TP 6,8,11	ER-MLRS ER-MLRS/Guide ER-MLRS ER-MLRS/Guide
C BTY 1ST BN 2ND BDE X CORPS ARTY	25% 25% 32% 32% 24% 24% 23% 23%	TP 3,4,5,9 TP 3,4,5,9 TP 7 & 8 TP 7 & 8 TP 10 & 11 TP 10 & 11 TP 12 TP 12	ER-MLRS ER-MLRS/Guide ER-MLRS ER-MLRS/Guide ER-MLRS ER-MLRS/Guide ER-MLRS ER-MLRS/Guide
A BTY 2ND BN 2ND BDE X CORPS ARTY	25% 25% 25% 26% 26% 26%	TP 2 - 9,12 TP 2 - 9,12 TP 3 - 9,12 TP 10 & 11 TP 10 & 11 TP 10 & 11	ER-MLRS ER-MLRS/Guide M26 ER-MLRS ER-MLRS/Guide M26
B BTY 2ND BN 2ND BDE X CORPS ARTY	16% 25% 25% 41% 42% 26% 26%	TP 2 TP 3 - 10 TP 3 - 10 TP 3,4,6,7,10 TP 5,8,9,11,12 TP 11 TP 11	M26 ER-MLRS ER-MLRS/Guide M26 M26 ER-MLRS ER-MLRS/Guide
C BTY 2ND BN 2ND BDE X CORPS ARTY	25% 25%	TP 3,4,5 TP 3,4,5	ER-MLRS ER-MLRS/Guide
A BTY 1ST BN 3RD BDE X CORPS ARTY	46% 35% 34% 40% 43% 33%	TP 7 TP 8 TP 9 TP 10 & 11 TP 11 TP 12	ER-MLRS/Guide ER-MLRS/Guide ER-MLRS/Guide M26 ER-MLRS/Guide ER-MLRS/Guide
B BTY 1ST BN 3RD BDE X CORPS ARTY	46% 32% 44% 30% 44% 37% 27% 42%	TP 7 TP 8 TP 8 TP 9 TP 10 TP 11 TP 12 TP 12	ER-MLRS/Guide ER-MLRS/Guide M26 ER-MLRS/Guide ER -MLRS/Guide ER-MLRS/Guide ER-MLRS/Guide M26
C BTY 1ST BN 3RD BDE X CORPS ARTY	47% 34% 30% 32% 46% 36% 28%	TP 7 TP 8 TP 9 TP 9 TP 10 TP 11 TP 12	ER-MLRS/Guide ER-MLRS/Guide ER-MLRS/Guide M26 ER -MLRS/Guide ER-MLRS/Guide ER-MLRS/Guide
A BTY 2ND BN 3RD BDE X CORPS ARTY	48% 32% 45% 36% 19% 28%	TP 7 TP 8 TP 10 TP 11 TP 11 TP 12	ER-MLRS/Guide ER-MLRS/Guide ER-MLRS/Guide ER-MLRS/Guide M26 ER-MLRS/Guide

Unit Name	BOH(1%-49%)	Time Period(TP)	Sub-munition
B BTY 2ND BN 3RD BDE X CORPS ARTY	44%	TP 7	ER-MLRS/Guide
	33%	TP 8	ER-MLRS/Guide
	25%	TP 9	ER-MLRS
	45%	TP 10	ER-MLRS/Guide
	36%	TP 11	ER-MLRS/Guide
	25%	TP 11 & 12	M26
	28%	TP 12	ER-MLRS/Guide
C BTY 2ND BN 3RD BDE X CORPS ARTY	47%	TP 7	ER-MLRS/Guide
	32%	TP 8	ER-MLRS/Guide
	30%	TP 9	ER-MLRS/Guide
	45%	TP 10	ER-MLRS/Guide
	36%	TP 11	ER-MLRS/Guide
	28%	TP 12	ER-MLRS/Guide
	25%	TP 12	M26
4 BN-A MLRS BTY EXFOR DIVARTY	25%	TP 3,4,5,6	ER-MLRS
	42%	TP 7	ER-MLRS
	33%	TP 8	ER-MLRS/Guide
	23%	TP 8 - 12	MSTAR
	28%	TP 9	ER-MLRS/Guide
	19%	TP 9	M26
	19%	TP 10	ER-MLRS/Guide
	38%	TP 11	ER-MLRS/Guide
	32%	TP 12	ER-MLRS/Guide
4 BN-B MLRS BTY EXFOR DIVARTY	25%	TP 3,4,5,6	ER-MLRS
	42%	TP 7	ER-MLRS
	36%	TP 8	ER-MLRS/Guide
	40%	TP 8	MSTAR
	30%	TP 9	ER-MLRS/Guide
	12%	TP 9	M26
	42%	TP 9	MSTAR
	20%	TP 10	ER-MLRS/Guide
	43%	TP 10	MSTAR
	40%	TP 11	ER-MLRS/Guide
	44%	TP 11 & 12	MSTAR
	35%	TP 12	ER-MLRS/Guide

MLRS Emergency Replenishment
Table L-17

Unit Name	BOH(1%-49%)	Time Period(TP)	Sub-munition
TASK FORCE 1ST BN 1ST BDE MECH INF	49%	TP 8	PGMM
TASK FORCE 1ST BN 3RD BDE ARMOR	35%	TP 10 & 12	PGMM
	36%	TP 11	PGMM
TASK FORCE 2ND BN 1ST BDE ARMOR	41%	TP 8	PGMM
	33%	TP 9 & 10	PGMM

120MM Emergency Replenishment
Table L-18

Unit Name	BOH(1%-49%)	Time Period(TP)	Sub-munition
TASK FORCE 2ND BN 3RD BDE MECH INF	46%	TP 10	JAVELIN
	47%	TP 11 & 12	

JAVELIN Emergency Replenishment
Table L-19

- Zero Balance on Hand: This column indicates whether or not the BOH by munition type at any unit fell to zero. Four of the munition types (155MM, ATACMS, MLRS, and 120MM) experience a zero balance on hand. Tables L-20 through L-23 depict specific unit, time period, and sub-munition type which experience a zero balance on hand.

Unit Name	HCN(=0)	Time Period(TP)	Sub-munition
A BTY 4TH BN 2ND BDE X CORPS ARTY	0%	TP 1 - 12	XM982
	0%	TP 2	M107(CB)
	0%	TP 2	M549A1
	0%	TP 2, 5 - 12	M483A1
B BTY 4TH BN 2ND BDE X CORPS ARTY	0%	TP 2	M107(CB)
	0%	TP 2, 5 - 12	M483A1
	0%	TP 2	M549A1
	0%	TP 3 - 12	M864
	0%	TP 2 - 12	XM982
C BTY 4TH BN 2ND BDE X CORPS ARTY	0%	TP 2 & 3	M107(CB)
	0%	TP 2, 5 - 12	M483A1
	0%	TP 2	M549A1
	0%	TP 3 - 12	M864
	0%	TP 2 - 12	XM892
A BTY 4TH BN 3RD BDE X CORPS ARTY	0%	TP 5 - 12	M483A1
	0%	TP 7 - 12	M864
B BTY 4TH BN 3RD BDE X CORPS ARTY	0%	TP 6 - 12	M483A1
C BTY 4TH BN 3RD BDE X CORPS ARTY	0%	TP 6 - 12	M483A1
1 BN-A 155SP BTRY (HIP) EXFOR DIVARTY	0%	TP 2, 9 - 12	M107(CB)
1 BN-B 155SP BTRY (HIP) EXFOR DIVARTY	0%	TP 2, 9 - 12	M107(CB)
	0%	TP 8 - 12	M483A1
1 BN-C 155SP BTRY (HIP) EXFOR DIVARTY	0%	TP 2, 9 - 12	M107(CB)
	0%	TP 11 & 12	M549A1
	0%	TP 11	XM982
2 BN-A 155SP BTRY (HIP) EXFOR DIVARTY	0%	TP 8 - 12	M483A1
2 BN-B 155SP BTRY (HIP) EXFOR DIVARTY	0%	TP 9 & 10	M107(CB)
	0%	TP 8 - 12	M483A1
2 BN-C 155SP BTRY (HIP) EXFOR DIVARTY	0%	TP 9 & 10	M107(CB)
	0%	TP 10	M483A1
	0%	TP 10,11,12	XM982
5 BN-A 155SP BTRY (HIP) EXFOR DIVARTY	0%	TP 10,11,12	M107(CB)
	0%	TP 8 - 12	M483A1
	0%	TP 11 & 12	M864
	0%	TP 11 & 12	XM982
5 BN-B 155SP BTRY (HIP) EXFOR DIVARTY	0%	TP 11 & 12	M107(CB)
	0%	TP 10,11,12	M483A1
	0%	TP 11 & 12	M864
	0%	TP 11 & 12	XM982
5 BN-C 155SP BTRY (HIP) EXFOR DIVARTY	0%	TP 10	M107(CB)
	0%	TP 10,11,12	M483A1
	0%	TP 11 & 12	M864
	0%	TP 11 & 12	XM982

155MM Zero Balance
Table L-20

Unit Name	HCN(=0)	Time Period(TP)	Sub-munition
A BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)	0%	TP 1 - 12	ATACMS-I
	0%	TP 3 - 12	ATACMS-IA
	0%	TP 5 - 12	ATACMS-II
	0%	TP 5 - 12	ATACMS-IIA
B BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)	0%	TP 1 - 12	ATACMS-I
	0%	TP 1 - 12	ATACMS-IA
	0%	TP 5 - 12	ATACMS-II
	0%	TP 5 - 12	ATACMS-IIA
C BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)	0%	TP 1 - 12	ATACMS-I
	0%	TP 3 - 12	ATACMS-IA
	0%	TP 5 - 12	ATACMS-II
	0%	TP 5 - 12	ATACMS-IIA
A BTY 1ST BN 2ND BDE X CORPS ARTY	0%	TP 1 - 12	ATACMS-I
	0%	TP 4 - 12	ATACMS-IA
	0%	TP 5 - 12	ATACMS-II
	0%	TP 5 - 12	ATACMS-IIA

Unit Name	BOH(=0)	Time Period(TP)	Sub-munition
B BTY 1ST BN 2ND BDE X CORPS ARTY	0%	TP 1 - 12	ATACMS-I
	0%	TP 4 - 12	ATACMS-IA
	0%	TP 5 - 12	ATACMS-II
	0%	TP 5 - 12	ATACMS-IIA
C BTY 1ST BN 2ND BDE X CORPS ARTY	0%	TP 1 - 12	ATACMS-I
	0%	TP 4 - 12	ATACMS-IA
	0%	TP 5 - 12	ATACMS-II
	0%	TP 5 - 12	ATACMS-IIA
A BTY 1ST BN 3RD BDE X CORPS ARTY	0%	TP 6 - 12	ATACMS-I
	0%	TP 6 - 12	ATACMS-II

ATACMS Zero Balance
Table L-21

Unit Name	BOH(=0)	Time Period(TP)	Sub-munition
A BTY 1ST BN 1ST BDE X CORPS ARTY (MLRS)	0%	TP 1, 4 - 12	ER-MLRS
	0%	TP 7 - 12	ER-MLRS/Guide
	0%	TP 8 - 12	M26
B BTY 1ST BN 1ST BDE X CORPS ARTY (MLRS)	0%	TP 1,2, 4 - 12	ER-MLRS
	0%	TP 7 - 12	ER-MLRS/Guide
C BTY 1ST BN 1ST BDE X CORPS ARTY (MLRS)	0%	TP 1,2, 4 - 12	ER-MLRS
	0%	TP 7 - 12	ER-MLRS/Guide
A BTY 2ND BN 1ST BDE X CORPS ARTY (MLRS)	0%	TP 1,2, 4 - 12	ER-MLRS
	0%	TP 10 & 12	ER-MLRS/Guide
B BTY 2ND BN 1ST BDE X CORPS ARTY (MLRS)	0%	TP 1,2, 7 - 12	ER-MLRS
C BTY 2ND BN 1ST BDE X CORPS ARTY (MLRS)	0%	TP 1,2,8,10 - 12	ER-MLRS
A BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)	0%	TP 1,2, 8 - 12	ER-MLRS
B BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)	0%	TP 1,2,10,11	ER-MLRS
	0%	TP 8 - 12	ER-MLRS/Guide
C BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)	0%	TP 1, 8 - 12	ER-MLRS
A BTY 1ST BN 2ND BDE X CORPS ARTY	0%	TP 1 & 2	ER-MLRS
	0%	TP 1 & 2	ER-MLRS/Guide
B BTY 1ST BN 2ND BDE X CORPS ARTY	0%	TP 1 & 2	ER-MLRS
	0%	TP 1 & 2	ER-MLRS/Guide
C BTY 1ST BN 2ND BDE X CORPS ARTY	0%	TP 1 & 2	ER-MLRS
	0%	TP 1 & 2	ER-MLRS/Guide
A BTY 2ND BN 2ND BDE X CORPS ARTY	0%	TP 1	ER-MLRS
	0%	TP 1	ER-MLRS/Guide
	0%	TP 2	M26
B BTY 2ND BN 2ND BDE X CORPS ARTY	0%	TP 1 & 2	ER-MLRS
	0%	TP 1 & 2	ER-MLRS/Guide
C BTY 2ND BN 2ND BDE X CORPS ARTY	0%	TP 1 & 2	ER-MLRS
	0%	TP 1 & 2	ER-MLRS/Guide
A BTY 1ST BN 3RD BDE X CORPS ARTY	0%	TP 7 - 12	ER-MLRS
B BTY 1ST BN 3RD BDE X CORPS ARTY	0%	TP 7 - 12	ER-MLRS
	0%	TP 9,10,11	M26
C BTY 1ST BN 3RD BDE X CORPS ARTY	0%	TP 7 - 12	ER-MLRS
	0%	TP 10,11,12	M26
A BTY 2ND BN 3RD BDE X CORPS ARTY	0%	TP 7 - 12	ER-MLRS
	0%	TP 8,9,10,12	M26
B BTY 2ND BN 3RD BDE X CORPS ARTY	0%	TP 7,8,10,11,12	ER-MLRS
	0%	TP 8 - 10	M26
C BTY 2ND BN 3RD BDE X CORPS ARTY	0%	TP 7 - 12	ER-MLRS
	0%	TP 8 - 11	M26
4 BN-A MLRS BTY EXFOR DIVARTY	0%	TP 2,7 - 12	ER-MLRS
	0%	TP 10,11,12	M26
4 BN-B MLRS BTY EXFOR DIVARTY	0%	TP 2,7 - 12	ER-MLRS
	0%	TP 10,11,12	M26

MLRS Zero Balance
Table L-22

Unit Name	BOH(-0)	Time Period(TP)	Sub-munition
A TRP DIV CAV SQDN	0%	TP 2	PGMM
B TRP DIV CAV SQDN	0%	TP 2	PGMM

120MM Zero Balance
Table L-23

(c) Problems. Of the 2072.2 stons ordered, via standard resupply, 2071.6 stons were shipped (approximately 99.97 percent). Problems in unfilled orders are associated with unavailable transporters or replenishments (reference table L-24).

TP	REQUESTING UNIT	SUPPLY UNIT	SUPPLY TYPE	AMOUNT REQUESTED (Rounds)	AMOUNT SHIPPED (Rounds)	AMOUNT SHORTED (%)	TRUCKS AVAIL	AVAIL STOCKS (Rounds)
5	B2001DC	B001ASP	PGMM	22	1	95.5	8.6	0
	TOTAL			22	1	95.5		0

Problems Filling Maneuver Unit Orders, Class V
Table L-24

- The problems of unfilled orders have rippled into maneuver units. In the table below, supply type-maneuver unit combinations that have a zero BOH are presented. The table has been coded: 0 - time and distance problems; 1 - unsupported materiel; 2 - insufficient replenishment stockages; and 3 - unavailable transporters. Generally, once a unit experienced a zero BOH, the zero BOH continued to the end of the scenario.

- From table L-25 below, zero BOH are attributed to shortages of transporters, shortages of replenishments, and large time-distances between maneuver units and their supporting CSS unit. The reader is cautioned regarding the "0"; some maneuver units consume everything on-hand, and cannot be provided a supply type fast enough regardless of the speed of the CSS system.

SUPPLY TYPE	MANEUVER UNIT	TP														# TPs
		0	1	2	3	4	5	6	7	8	9	10	11	12		
ER-MLRS	B00A1M2											1	1		2	
ER-MLRS	B00A2M2											1	1	1	3	
ER-MLRS	B00A3M2											1	1		2	
ER-MLRS	B00A4M2			1								1	1		3	
ER-MLRS	B00A5M2			1									1		2	
ER-MLRS	B00A6M2											1	1		2	
ER-MLRS	B00A8M2												1		1	
ER-MLRS	B00A9M2												1		1	
ER-MLRS	B00B5M2			1											1	
ER-MLRS	B00C1M2												1		1	
ER-MLRS	B00C2M2												1		1	
ER-MLRS	B00C3M2												1		1	
ER-MLRS	B00C4M2												1	1	2	
ER-MLRS	B00C5M2												1	1	2	
ER-MLRS	B00C6M2											1	1		2	
ER-MLRS	B200GM2			1		1						1		1	4	
ER-MLRS	B200HM2			1		1						1			3	
M107 (CB)	B00BBH2					0									1	

SUPPLY TYPE	MANEUVER UNIT	TP													# TPs
		0	1	2	3	4	5	6	7	8	9	10	11	12	
M107(CB)	B00BCH2					0									1
M107(CB)	B200AH2				0										1
M107(CB)	B200BH2					0									1
M107(CB)	B200CH2					0									1
M483A1	B00ACH2					0									1
M483A1	B200DH2					0									1
M483A1	B200EH2					0									1
M483A1	B200FH2					0									1
M483A1	B200JH2					0									1
M483A1	B200KH2					0									1
M549A1	B00AAH2											0	0		2
M549A1	B00ABH2												0	0	2
M549A1	B00ACH2											0	0		2
M549A1	B00CAH2											0	0		2
M549A1	B00CCH2												0	0	2
M549A1	B200DH2												0		1
M864	B00ACH2											0	0		2
M864	B00CAH2											0	0		2
M864	B00CBH2													0	1
M864	B00CCH2													0	1
M864	B200DH2					0									1
M864	B200EH2					0									1
M864	B200FH2											0			1
M864	B200JH2											0			1
M864	B200KH2											0		0	2
M864	B200LH2											0	0	0	3
M864	B201MX				0										1
M864	B203MX												0	0	2
XM982	B00BAH2			0											1
XM982	B200LH2												0		1

Causes for Zero BOH
Table L-25

To quantify a measure of risk, the maximum consumption of class V by a unit for any TP is compared with the current BOH for each TP; if the value is less than one, the unit would exhaust its supplies prior to repeating the activities of this "maximum" TP. Where "at risk" is less than one TP of supply, class V was generally provided to maneuver units without placing them "at risk." Fifty maneuver units were "at risk." See Table L-26.

MANEUVER UNIT	TP													# of TPs
	0	1	2	3	4	5	6	7	8	9	10	11	12	
B00A1M2		2	2	3	3	3	3	3	3	3	3	3	3	12
B00A2M2		2	2	2	2	2	2	2	2	3	3	3	2	12
B00A3M2		2	2	2	2	2	2	2	2	2	3	3	2	12
B00A4M2		2	2	2	2	2	2	2	2	2	2	2	2	12
B00A5M2		1	1	1	1	1	1	2	2	2	2	2	2	12
B00A6M2		1	1	1	1	1	1	1	2	2	2	2	2	12
B00A7M2		4	4	3	3	5	5	5	6	6	6	6	6	12
B00A8M2		4	4	4	4	6	6	6	6	6	6	6	6	12
B00A9M2		4	4	3	3	5	5	5	6	6	6	6	6	12
B00B1M2		3	4	4	4	6	6	6	6	6	6	6	6	12
B00B2M2		3	3	4	4	6	6	6	6	6	6	6	6	12
B00B3M2		3	3	4	4	6	6	6	6	6	6	6	6	12
B00B4M2		2	3	3	3	3	3	3	3	3	3	3	3	12
B00B5M2		2	3	3	3	3	3	3	3	3	3	3	3	12
B00B6M2		2	2	2	2	2								5
B00BAH2			6	6	6	6	6	6	6	6	6	6	6	11
B00BBH2			6	6	6	6	6	6	6	6	6	6	6	11
B00BCH2			6	6	6	6	6	6	6	6	6	6	6	11
B00C1M2						1	2	4	4	4	4	4	4	8
B00C2M2								2	3	3	3	3	3	6
B00C3M2								2	2	3	3	3	3	6
B00C4M2								2	3	3	3	3	3	6
B00C5M2								2	3	3	3	3	3	6
B00C6M2								2	3	3	3	3	3	6
B00CAH2						1	2	4	6	5	6	6	5	8
B00CBH2						1	1	3	6	4	6	6	6	8
B00CCH2						1	1	3	6	4	5	6	5	8
B20000H	6	6	6	6	6	6	6	6	6	6	6	6	6	13
B2001DC			1	1	1	1	1	1	1	1	1	1	1	11
B2002DC			2	2	1	1	1	1	1	1	1	1	1	11
B2003DC						1	1	1	1	1	1	1	1	8
B200AH2			2	1	1	1	1	1	3	5	5	5	5	11
B200BH2			2	2	2	2	2	2	3	3	3	5	5	11
B200CH2			1	1	1	1	1	1	3	3	3	5	5	11
B200DH2				1	1	1	1	1	3	4	5	4	4	10
B200EH2				1	1	1	1	1	2	3	4	4	4	10
B200FH2				1	1	1	1	1	2	4	4	4	4	10
B200GM2			1	1	1	1	1	2	3	4	4	4	4	11
B200HM2			1	1	1	1	1	2	2	3	3	3	3	11
B200JH2					2	2	2	2	2	2	3	4	4	9
B200KH2					2	2	2	2	2	2	2	4	4	9
B200LH2					1	1	1	1	1	1	2	4	4	9
B2011MX	1	1	1	1	1	1	1	1	2	1	2	1	2	13
B2012MX	1	1	1	1	1	1	1	1	1	1	1	1	1	13
B2013AR									1	1	1	1	1	5
B2021AR									1	1	1	1	1	5
B2023MX	1	1	1	1	1	1	1	1	1	1	3	3	2	13

MANEUVER UNIT	TP													
	0	1	2	3	4	5	6	7	8	9	10	11	12	# of TPs
B2031MX	1	1	1	1	1	1	1	1	1	1	1	1	1	13
B2032MX	1	1	1	1	1	1	1	1	1	1	1	1	1	13
B20S00H	1	1	1	1	1	1	1	1	1	1	1	1	1	13

"At Risk" Units, Class V Risk
Table L-26

(d) Observations.

- 1) There were several occurrences of zero balance on hand for the 155MM munition type, however, at no time were all 155MM sub-munition categories at zero balance.
- 2) 3rd Bn 1st Bde CORPS Arty and 1st Bn 2nd Bde CORPS Arty expended all of their ATACMS munition type in TP 5 through the end of the scenario. There was an insufficient quantity of ATACMS munition type available by the end of the scenario.
- 3) For the MLRS munition type, the ER-MLRS sub-munition had a few occurrences of zero balance; however, at no time were all MLRS sub-munition categories at zero balance.

APPENDIX A

DDA VIC Name to Unit Name Cross Reference

VIC Name	Unit Name
B000CSB	10 CORPS REAR (For Modeling Only)
B00RCSB	10 CORPS REAR
B000000	10th CORPS
B003IA1	AVENGER PLT
B003JA1	AVENGER PLT
B003KA1	AVENGER PLT
B003LA1	AVENGER PLT
B003MA1	AVENGER PLT
B003NA1	AVENGER PLT
B000PAT	PATRIOT BATTALION HQ
B001PAT	A BTRY PATRIOT BN
B002PAT	B BTRY PATRIOT BN
B003PAT	C BTRY PATRIOT BN
B004PAT	D BTRY PATRIOT BN
B005PAT	E BTRY PATRIOT BN
B001USF	1ST US SOF TEAM ODA 171
B002USF	2ND US SOF TEAM ODA 172
B003USF	3RD US SOF TEAM ODA 173
B004USF	4TH US SOF TEAM ODA 174
B005RSF	5TH SOF TEAM
B006RSF	6TH SOF TEAM
B007RSF	7TH SOF TEAM
B008RSF	8TH SOF TEAM
B009RSF	9TH SOF TEAM
B010RSF	10TH SOF TEAM
B001CSA	1ST CORPS SUPPLY AREA 551ST AMMO GS
B001ASP	AMMO SUPPLY POINT
B002ASP	AMMO SUPPLY POINT
B003ASP	AMMO SUPPLY POINT (SUPPORTING 52TH)
B004ASP	AMMO SUPPLY POINT (ARTY ASP)
B001POL	CORPS SUPPORT AREA (POL)
B001CSB	CORPS SUPPORT BN FORWARD (POL)
B001SUP	CORPS SUPPLY AREA (SUB)
B002SUP	CORPS SUPPORT BN FORWARD (SUB)
B0001EN	EN CO
B0002EN	EN CO
B0003EN	EN CO
B0004EN	EN CO
B0005EN	EN CO
B0006EN	EN CO
B0007EN	EN CO
B0008EN	EN CO
B00A002	1ST FA BDE X CORPS HQ
B00A1M2	A BTY 1ST BN 1ST BDE X CORPS ARTY (MLRS)
B00A2M2	B BTY 1ST BN 1ST BDE X CORPS ARTY (MLRS)
B00A3M2	C BTY 1ST BN 1ST BDE X CORPS ARTY (MLRS)
B00A4M2	A BTY 2ND BN 1ST BDE X CORPS ARTY (MLRS)

VIC Name	Unit Name
B00A5M2	B BTY 2ND BN 1ST BDE X CORPS ARTY (MLRS)
B00A6M2	C BTY 2ND BN 1ST BDE X CORPS ARTY (MLRS)
B00A7M2	A BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)
B00A8M2	B BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)
B00A9M2	C BTY 3RD BN 1ST BDE X CORPS ARTY (MLRS)
B00AAH2	A BTY 4TH BN 1ST BDE X CORPS ARTY (CRUS)
B00ABH2	B BTY 4TH BN 1ST BDE X CORPS ARTY (CRUS)
B00ACH2	C BTY 4TH BN 1ST BDE X CORPS ARTY (CRUS)
B00B002	2ND FA BDE X CORPS ARTY HQ
B00B1M2	A BTY 1ST BN 2ND BDE X CORPS ARTY
B00B2M2	B BTY 1ST BN 2ND BDE X CORPS ARTY
B00B3M2	C BTY 1ST BN 2ND BDE X CORPS ARTY
B00B4M2	A BTY 2ND BN 2ND BDE X CORPS ARTY
B00B5M2	B BTY 2ND BN 2ND BDE X CORPS ARTY
B00B6M2	C BTY 2ND BN 2ND BDE X CORPS ARTY
B00BAH2	A BTY 4TH BN 2ND BDE X CORPS ARTY
B00BBH2	B BTY 4TH BN 2ND BDE X CORPS ARTY
B00BCH2	C BTY 4TH BN 2ND BDE X CORPS ARTY
B00C002	3RD FA BDE X CORPS ARTY HQ
B00C1M2	A BTY 1ST BN 3RD BDE X CORPS ARTY
B00C2M2	B BTY 1ST BN 3RD BDE X CORPS ARTY
B00C3M2	C BTY 1ST BN 3RD BDE X CORPS ARTY
B00C4M2	A BTY 2ND BN 3RD BDE X CORPS ARTY
B00C5M2	B BTY 2ND BN 3RD BDE X CORPS ARTY
B00C6M2	C BTY 2ND BN 3RD BDE X CORPS ARTY
B00CAH2	A BTY 4TH BN 3RD BDE X CORPS ARTY
B00CBH2	B BTY 4TH BN 3RD BDE X CORPS ARTY
B00CCH2	C BTY 4TH BN 3RD BDE X CORPS ARTY
B00A00H	1 BN GS BDE X CORPS AVN (LIFT)
B00G00H	1 BN /2 BN CORPS AV
B00H00H	3RD ACR AIR CAV SQDN
B2000AR	EXFOR DIVISION
B200DSA	EXFOR DISCOM
B201GA1	AVENGER PLT
B2003EN	553 EN BN
B2004EN	554 EN BN
B2000DC	DIVISION CAV SQDRN
B2001DC	A TRP
B201BA1	AVENGER PLT
B2002DC	B TRP
B2003DC	C TRP
B011RSF	10TH SOF TEAM
B012RSF	10TH SOF TEAM
B013RSF	10TH SOF TEAM
B014RSF	10TH SOF TEAM
B2010MX	1 BDE EXFOR (MX)
B2011DC	1 BDE RECON CO
B2011MX	TF 1-1 MX
B2011FC	FORWARD SUPPORT COMPANY

VIC Name	Unit Name
B2012MX	TF 1-2 MX
B2012FC	FORWARD SUPPORT COMPANY
B2013AR	TF 1-3 AR
B2013FC	FORWARD SUPPORT COMPANY
B201FSB	FSB 1 BDE EXFOR (MX)
B201AA1	BSFV PLT
B201KA1	BSFV PLT
B2020AR	2 BDE EXFOR (AR)
B2021DC	2 BDE RECON CO
B2021AR	TF 2-1 AR
B2021FC	FORWARD SUPPORT COMPANY
B2022AR	TF 2-2 AR
B2022FC	FORWARD SUPPORT COMPANY
B2023MX	TF 2-3 MX
B2023FC	FORWARD SUPPORT COMPANY
B2033AR	TF 3-2 IN
B2033FC	FORWARD SUPPORT COMPANY
B201CA1	BSFV PLT
B201JA1	BSFV PLT
B201LA1	BSFV PLT
B201DA1	AVENGER PLT
B202FSB	FSB 2 BDE EXFOR (AR)
B2030MX	3 BDE EXFOR (IN)
B2031DC	3 BDE RECON CO
B2031MX	TF 3-1 IN
B2031FC	FORWARD SUPPORT COMPANY
B2032MX	TF 3-2 IN
B2032FC	FORWARD SUPPORT COMPANY
B201EA1	BSFV PLT
B201FA1	AVENGER PLT
B203FSB	FSB 3 BDE EXFOR (MX)
B20000H	AV BDE EXFOR
B20S00H	DIV CAV (RAH66D)
B201HA1	AVENGER PLT
B20L00H	1 BN ATK EXFOR AV
B20020H	2 BN LIFT EXFOR AV
B200002	DIVARTY EXFOR
B201IA1	AVENGER PLT
B200AH2	1 BN-A 155SP BTRY (HIP) EXFOR DIVARTY
B200BH2	1 BN-B 155SP BTRY (HIP) EXFOR DIVARTY
B200CH2	1 BN-C 155SP BTRY (HIP) EXFOR DIVARTY
B200DH2	2 BN-A 155SP BTRY (HIP) EXFOR DIVARTY
B200EH2	2 BN-B 155SP BTRY (HIP) EXFOR DIVARTY
B200FH2	2 BN-C 155SP BTRY (HIP) EXFOR DIVARTY
B200GM2	4 BN-A MLRS BTY EXFOR DIVARTY
B200HM2	4 BN-B MLRS BTY EXFOR DIVARTY
B200JH2	5 BN-A 155SP BTRY (HIP) EXFOR DIVARTY
B200KH2	5 BN-B 155SP BTRY (HIP) EXFOR DIVARTY
B200LH2	5 BN-C 155SP BTRY (HIP) EXFOR DIVARTY

APPENDIX B

DEFINITIONS

Specific supply analysis definitions are listed below:

(1) Amount Authorized of this supply type: Amount of this supply type that this unit is authorized at the end of the TP, this number is calculated by multiplying the number of available systems that use this supply type by the amount authorized per system. This number can change from one TP to another due to weapon losses.

(2) Balance on-Hand of this supply type: Amount of this supply type that this unit has on hand at the end of the TP.

(3) Amount Used during this TP: Amount of this supply type that this unit used during this TP.

(4) Amount Lost during this TP: Amount of this supply type that this unit lost due to attrition of systems (when a system is damaged in combat a percentage (50%) of its on-board supplies are lost).

(5) Ratio of Balance on-Hand to Amount Authorized: A percent value used to indicate overall assessment of a munition; when this percent value is low, a greater risk is indicated as to possibility of exhausting all supplies.

(6) Total Amount Authorized during this TP: The sum of each amount authorized of each supply type at the end of the TP. The stockages are redistributed, consumed, or lost as the scenario proceeds. As units are engaged and attrited, the amount-authorized is reconciled with the number of surviving weapon systems.

(7) Total Amount on-Hand during this TP: The sum of the amount of each supply type that the units actually have in stock at the end of the TP. This amount is reduced by consumption, attrition, and other activities that may reduce the stockage of a supply type.

(8) Total Amount Used during this TP: The sum of the amount of each supply type consumed as a result of movement and combat at the end of the TP.

(9) Total Amount Lost during this TP: The sum of the amount of each supply type lost due to attrition of systems at the end of the TP (when a system is damaged in combat, a percentage of its on-board supplies are lost).

(10) Total Amount on-Order during this TP: The sum of the amounts of each supply ordered by each unit during a period. As materiel is consumed, units initiate orders based on a re-order threshold to restock its supplies. If an order cannot be shipped for reasons of shortages of stocks or movers, a unit will re-order the replenishments during the next period.

(11) Timely fashion: The manner in which a unit is supported when a negative consequence did not result. When a maneuver unit calls for replenishment of supplies, the support of the maneuver unit shall be said to be in a "timely fashion," if the maneuver unit did not suffer for lack of supplies. For class III, a unit suffers when it is forced to stop for lack of class III. For class V, a unit suffers a negative consequence when it exhausts a class V supply type.

(12) Risk: The proportion of TPs that each supply type for each unit can be expected to last given the greatest consumption for the scenario. The higher the measure, the greater the quantity of stockage, hence the lower the likelihood of not being able to repeat the highest consumption of a TP.

(13) Standard Resupply: Maneuver units will generate an order for a supply type when, per the resupply schedule, the on-hand plus on-order quantity is less than 75 percent of the authorized quantity. The magnitude of the order is the amount of each supply type to bring the on-hand plus on-order quantity up to the authorized quantity. Routinely, the order is for 25% of authorized. When the shipment arrives, the on-hand balance will increase, and the maneuver unit will issue an order when the on-hand quantity again falls below the 75% authorized. Exceptions to this resupply process occur when, for lack of trucks or stocks, an order cannot be filled or shipped. When the order (or portion of same) cannot be shipped in the period it was requested, the unfilled portion is lost - there are no backorders or due-outs. The maneuver unit will reassess its needs during the next period. Standard resupply can be divided into two types: supply point distribution (SPD) and unit distribution (UD). A unit that uses SPD provides its own organic transporters to convey replenishments between the supply unit(s) and itself; a unit using UD requires the supply unit to provide both replenishments and transporters.

(14) Emergency Resupply: Maneuver units will generate an "emergency" order for a supply type when, per the resupply schedule, the on-hand plus on-order quantity is less than 50 percent of the authorized quantity. The magnitude of the order is the amount of each supply type to bring the on-hand quantity up to 50% of the authorized quantity. When the shipment arrives, the on-hand balance will increase. This is "emergency resupply." Emergency resupply is subject to a number of factors: (1) the availability of replenishment stockages; (2) the availability of helicopter support to provide airlift between the supporting CSS unit(s) and the requesting maneuver unit; and (3) the hostile environment surrounding the maneuver unit. If the scenario is short-lived or has intensive combat, the last factor can be the most limiting. Helicopters will not provide lift to maneuver units that are under assault. If any one of the factors prohibits emergency resupply, the "emergency" request for replenishments will be routed for "standard" resupply. When the order (or portion of same) cannot be shipped in the time period it was requested, the unfilled portion is lost - there are no backorders or due-outs - the unit must wait for the next period per the resupply schedule to assess its stockage position and re-order.

APPENDIX C

FIGURES AND TABLES

TP	USED GALS	LOST GALS	REQUIREMENT CONSUMED	AMOUNT RECEIVED BY AIR	AMOUNT RECEIVED BY TRUCK	AMOUNT REQUESTED	AMOUNT SHIPPED	% of ORDERED
0	0	0	0	0	0	0	0	---
1	115,957	0	115,957	0	8,259	52,613.25	52,613.25	100
2	90,829	5	90,834	0	33,664	83,951.70	83,951.70	100
3	73,546	0	73,546	0	70,123	53,423.85	53,423.85	100
4	93,922	0	93,922	0	37,478	106,222.64	100,950.14	95
5	59,091	0	59,091	0	89,433	24,430.51	19,339.16	79
6	110,160	2,677	112,837	0	65,618	97,936.40	64,704.73	66
7	90,799	2,483	93,282	0	32,113	125,112.16	84,795.15	68
8	51,789	4,101	55,890	0	105,128	37,564.12	27,802.84	74
9	36,099	1,247	37,346	0	34,753	55,267.93	39,184.05	71
10	38,968	3,538	42,506	0	14,811	52,245.14	46,465.69	89
11	26,290	157	26,448	0	70,972	50,937.34	30,030.95	59
12	36,036	72	36,108	0	21,472	41,411.70	28,168.79	68
TOTAL	823,487	14,281	837,768	0	583,925	781,116.74	631,430.30	81

Consumption of Class III, Gallons
Table C-1

TP	USED STONS	LOST STONS	REQUIREMENT CONSUMED	AMOUNT RECEIVED BY AIR	AMOUNT RECEIVED BY TRUCK	AMOUNT REQUESTED	AMOUNT SHIPPED	% of ORDERED
0	0	0	0	0	0	0	0	---
1	1,305	0	1,305	0	0	264	264	100
2	1,426	0	1,426	0	18	528	528	100
3	239	0	239	0	669	75	75	100
4	181	0	181	0	182	24	24	100
5	374	0	374	0	2	18	17	94
6	139	17	156	0	1	45	45	100
7	613	7	620	0	16	155	155	100
8	1,573	35	1,608	0	4	645	645	100
9	894	35	929	0	67	238	238	100
10	453	18	472	0	104	43	43	100
11	201	2	203	0	200	38	38	100
12	59	1	60	0	486	1	1	100
TOTAL	7,459	115	7,574	0	1,748	2,072.19	2,071.60	100

Consumption of Class V, STONS
Table C-2

CLASS III & V, TRUCKLOADS BY TP														
TP	ER-MLRS	LONGBOW	M107(CB)	M26	M483A1	M549A1	M795	M864	PGMM	POL-B	STINGER	XMB98	XM982	TOTAL
1	11.9	1.0						0.3		17.3			0.2	30.7
2	13.0	1.4	2.0	16.5	1.1	1.0	1.1	0.4	0.1	39.2		0.8	0.5	77.1
3	13.0	1.4	2.0	19.2	1.7	1.0	1.1	0.5	0.1	59.6		0.8	0.5	100.9
4	13.0	1.4	2.0	19.2	2.2	1.0	1.1	0.8	0.1	92.5	0.2	0.8	0.5	134.8
5	13.0	1.4	2.0	19.2	2.8	1.0	1.1	0.8	0.1	100.4	0.2	0.8	0.5	143.3
6	13.0	5.0	2.0	19.2	2.8	2.8	1.1	0.9	0.1	132.1	0.3	0.8	0.5	180.6
7	18.3	5.0	2.2	19.2	2.8	1.0	1.1	1.6	0.1	175.0	0.3	1.1	1.7	229.4
8	18.3	5.0	3.4	46.5	3.2	1.9	1.1	2.3	0.2	188.2	0.3	1.7	1.7	273.8
9	18.3	5.0	4.0	56.4	3.2	2.0	1.1	2.3	0.2	206.4	0.3	2.0	2.6	303.8
10	18.3	5.0	4.4	56.4	3.2	2.0	1.1	2.6	0.2	223.1	0.4	2.3	3.5	322.5
11	18.3	5.0	4.5	56.4	3.2	2.4	1.1	2.7	0.2	240.5	0.4	2.3	4.8	341.8
12	18.3	5.0	4.5	56.4	3.2	2.4	1.1	2.7	0.2	255.8	0.4	2.3	4.8	357.1
CLASS III & V, PERCENTAGE BY TP														
TP	ER-MLRS	LONGBOW	M107(CB)	M26	M483A1	M549A1	M795	M864	PGMM	POL-B	STINGER	XMB98	XM982	TOTAL
1	38.7	3.3	0.0	0.0	0.0	0.0	0.0	1.0	0.0	56.4	0.0	0.0	0.7	100.0
2	16.9	1.8	2.6	21.4	1.4	1.3	1.4	0.5	0.1	50.8	0.0	1.0	0.6	100.0
3	12.9	1.4	2.0	19.0	1.7	1.0	1.1	0.5	0.1	59.1	0.0	0.8	0.5	100.0
4	9.6	1.0	1.5	14.2	1.6	0.7	0.8	0.6	0.1	68.6	0.1	0.6	0.4	100.0
5	9.1	1.0	1.4	13.4	2.0	0.7	0.8	0.6	0.1	70.1	0.1	0.6	0.3	100.0
6	7.2	2.8	1.1	10.6	1.6	1.6	0.6	0.5	0.1	73.1	0.2	0.4	0.3	100.0
7	8.0	2.2	1.0	8.4	1.2	0.4	0.5	0.7	0.0	76.3	0.1	0.5	0.7	100.0
8	6.7	1.8	1.2	17.0	1.2	0.7	0.4	0.8	0.1	68.7	0.1	0.6	0.6	100.0
9	6.0	1.6	1.3	18.6	1.1	0.7	0.4	0.8	0.1	67.9	0.1	0.7	0.9	100.0
10	5.7	1.6	1.4	17.5	1.0	0.6	0.3	0.8	0.1	69.2	0.1	0.7	1.1	100.0
11	5.4	1.5	1.3	16.5	0.9	0.7	0.3	0.8	0.1	70.4	0.1	0.7	1.4	100.0
12	5.1	1.4	1.3	15.8	0.9	0.7	0.3	0.8	0.1	71.6	0.1	0.6	1.3	100.0

Truckloads On-Road, CSS-to-Maneuver Units
Table C-3

CLASS III. AMOUNT ON-HAND BY HOUR																
	12,500	317,461	3,052,906	12,600	24,330	385,500	0	4,789	8,840	940	114,235	1,601	0	111,552	0	6,384
39	12,500	307,036	3,052,906	12,600	24,330	385,500	0	4,789	427	940	114,235	1,601	0	111,552	0	40
40	12,500	311,836	3,052,775	12,600	24,330	385,500	0	4,789	427	940	114,235	1,601	0	111,552	0	40
41	12,500	290,406	3,050,280	12,600	24,330	385,500	0	4,789	427	940	114,235	1,601	0	111,552	0	40
42	12,500	288,656	3,050,206	12,600	24,330	385,500	0	4,789	427	940	112,465	1,601	0	111,552	0	40
43	12,500	287,140	3,050,206	12,600	24,330	385,500	0	4,789	427	940	112,465	1,601	0	111,552	0	0
44	12,500	268,837	3,050,096	12,600	24,330	385,500	0	4,789	427	940	112,465	1,601	0	111,552	0	0
45	12,500	268,837	3,047,821	12,600	24,330	385,500	0	4,789	427	940	112,465	1,601	0	111,552	1,429	0
46	12,500	261,538	3,047,821	12,600	24,330	385,500	0	0	427	940	112,465	1,601	0	111,552	1,429	0
47	12,500	251,364	3,047,855	12,600	24,330	385,500	0	0	427	0	112,465	1,601	0	111,552	1,429	0
48	12,500															

Class III Balance for Supply Points, CSS-to Maneuver Units
Table C-4